

# '68'

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## MICRO JOURNAL

**VOLUME IV ISSUE I • Devoted to the 68XX User • January 1982**  
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# Pascal for 6809

Pascal for the 6809 is a true native code compiler. Unlike the usual P-code Pascals which run in an interpretive manner, ours produces efficient assembly language mnemonics which can be assembled and run directly. This compiler is available for both 6809 FLEX™ and UniFLEX™. Many features not found in other Pascal systems were implemented while avoiding those features completely non-standard. Features of the Pascal system include:

- Supports most of Jensen and Wirth specification
- Produces fast and efficient 6809, native code
- FLEX run-time package may be trimmed
- Double precision real numbers (16.8 digits)
- Implements scalar, subrange and structured data types
- Standard I/O using file buffer pointers
- Dynamic storage allocation
- Ability to call other Pascal programs
- FLEX version may call assembly language programs
- Buffered or single character terminal input
- Standard math functions: SIN, COS, ARCTAN, EXP, LN, SQR, SQRT
- Random number generator function
- Many usable, sample programs included
- UniFLEX version supports:
  - Random file positioning
  - Ability to call various UniFLEX system routines
  - Ability to execute UniFLEX utility commands

Pascal on diskette for 5" and 8" 6809 FLEX is available for \$200.00. The 5" version requires two disk drives. The UniFLEX version is \$300.00 and includes one year of maintenance. All orders should include 3 percent for postage and handling (10 percent on foreign orders).

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**technical systems  
consultants, inc.**

Box 2570, West Lafayette, IN 47906  
(317) 463-2502

# '68'

# MICRO JOURNAL

Portions of text prepared using the following.

SWTPC 6800-6809-DMAF2-COS1-CT82-Sprint 3  
Southwest Technical Products  
219 W. Rhapsody  
San Antonio, Texas 78216

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Technical Systems Consultants, Inc.  
Box 2573, W. Lafayette, IN 47906  
FLEX is TM of TSC

GIMIX Super Mainframe-Assorted memory boards  
GIMIX Inc.  
1337 West 37th Place  
Chicago, IL 60609

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January 1982  
VOL IV ... ISSUE I

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## Send All Correspondence To:

68 MICRO JOURNAL  
5900 Cassandra Smith  
Computer Publishing Center  
PO Box 849  
Hixson, TN 37343

615 842-4600

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'68' Micro Journal is published 12 times a year by '68' Micro Journal, 6131 Airways Blvd., Chattanooga, TN 37421. Second Class postage paid at Chattanooga, TN. Postmaster: Send Form 3579 to '68' Micro Journal, PO Box 849, Hixson, TN 37343.

1-Year \$18.50 2-Year \$32.50 3-Year \$48.50

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(Letters to the Editor for Publication) All 'letters to the Editor' should be substantiated by facts. Opinions should be indicated as such. All letters must be signed. We are interested in receiving letters that will benefit or alert our readers. Praise as well as gripes is always good subject matter. Your name may be withheld upon request. If you have had a good experience with a 6800 vendor please put it in a letter. If the experience was bad put that in a letter also. Remember, if you tell us who they are then it is only fair that your name 'not' be withheld. This means that all letters published, of a critical nature, cannot have a name withheld. We will attempt to publish 'verbatim' letters that are composed using 'good taste.' We reserve the right to define (for '68' Micro) what constitutes 'good taste.'

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## JUDGE THE REST, THEN BUY THE BEST

Only GIMIX offers you **SOFTWARE SWITCHING** between MICROWARE's OS-9 and TSC's FLEX. Plus you get the power of the GMXBUG system monitor with its advanced debugging utility, and memory manipulation routines. A wide variety of languages and other software is available for these two predominant 6809 Disk Operating Systems.

*You can order a system to meet your needs, or select from the 6809 Systems featured below.*

## JUDGE THE FEATURES AND QUALITY OF GIMIX 6809 SYSTEMS

GIMIX' CLASSY CHASSIS™ is a heavyweight aluminum mainframe cabinet with back panel cutouts to conveniently connect your terminals, printers, drives, monitors, etc. A 3 position keyswitch lets you lock out the reset switch. The power supply features a ferro-resonant constant voltage transformer that supplies 8V at 30 amps, + 15V at 5 amps, and - 15V at 5 amps to insure against problems caused by adverse power input conditions. It supplies power for all the boards in a fully loaded system plus two 5 1/4" drives (yes! even a Winchester) that can be installed in the cabinet. The Mother board has fifteen 50 pin and eight 30 pin slots to give you the most room for expansion of any SS50 system available. 11 standard baud rates from 75 to 38.4K are provided and the I/O section has its own extended addressing to permit the maximum memory address space to be used. The 2 Mhz 6809 CPU card has both a time of day clock with battery back-up and a 6840 programmable timer. It also contains 1K RAM, 4 PROM/ROM/RAM sockets, and provides for an optional 9511A or 9512 Arithmetic Processor. The RAM boards use high speed, low power STATIC memory that is fully compatible with any DMA technique. STATIC RAM requires no refresh timing, no wait states or clock stretching, and allows fast, reliable operation. The system includes a 2 port RS232 serial interface and cables. All GIMIX boards use gold plated bus connectors and are fully socketed. GIMIX designs, manufactures, and tests in-house its complete line of products. All boards are twice tested, and burned in electrically to insure reliability and freedom from infant mortality of component parts. All systems are assembled and then retested as a system after being configured to your specific order.

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Chart shows total capacity in Bytes for 2 drives.

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NOTE: UNIFLEX can not be used with 5" minifloppy drives.

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# CIS COBOL™

## The Natural Choice For Business Software



COBOL has been the universal business programming standard for nearly two decades. COBOL is rich in commercially-oriented facilities. It has powerful file handling, formatted printing, and data structure capabilities. It is English-like, so that programs are easy to read and maintain. By far, most organizations use COBOL as their main business programming language. One effect of this is that more professional business programmers know and use COBOL, and the best business application software is written in COBOL.

Microware has developed the 6809 version of Micro Focus's proven CIS COBOL compiler to allow you to run ANSI 1974 standard COBOL on your OS-9 based computer system. It's been certified as such by the U.S. General Services Administration, following stringent testing. This assures that CIS COBOL is compatible with standard minicomputer or mainframe COBOLs. And CIS COBOL has been proven on thousands of micro and mini systems all over the world.

Stability is an important advantage

of COBOL. Unlike some other languages, a firm standard has been established. Because of this, COBOL programs can be transferred from one machine to another with a minimum of modifications. COBOL users can take advantage of the mass of existing programs written in COBOL.

CIS stands for Compact, Interactive, and Standard—the most desirable qualities for microcomputer COBOL. And CIS COBOL offers you much more! It has been specially designed for interactive operation and efficient use on small computers. CIS COBOL has multi-user capability that allows more than one COBOL program to be run simultaneously. CIS COBOL extensions for conversational applications, screen control, interactive debugging, and OS-9's device-independent I/O system.

CIS COBOL's optional FORMS 2 program generator eliminates the need to write simple data entry and inquiry programs. It lets you build a

screen layout on line at the CRT, then automatically generates COBOL source code programs from your

screen definitions. Or you can use it to create the interactive screen handling portions of more complex programs.

CIS COBOL and FORMS 2 can be used with any disk-based 6809 computer system having at least 48K of user RAM running Microware's OS-9 Level One or OS-9 Level Two operating systems.

If you need to create business applications, COBOL is your natural choice. And if you want to run COBOL on your 6809 system—or want easy to use interactive business programming facilities—that means 6809 CIS COBOL.

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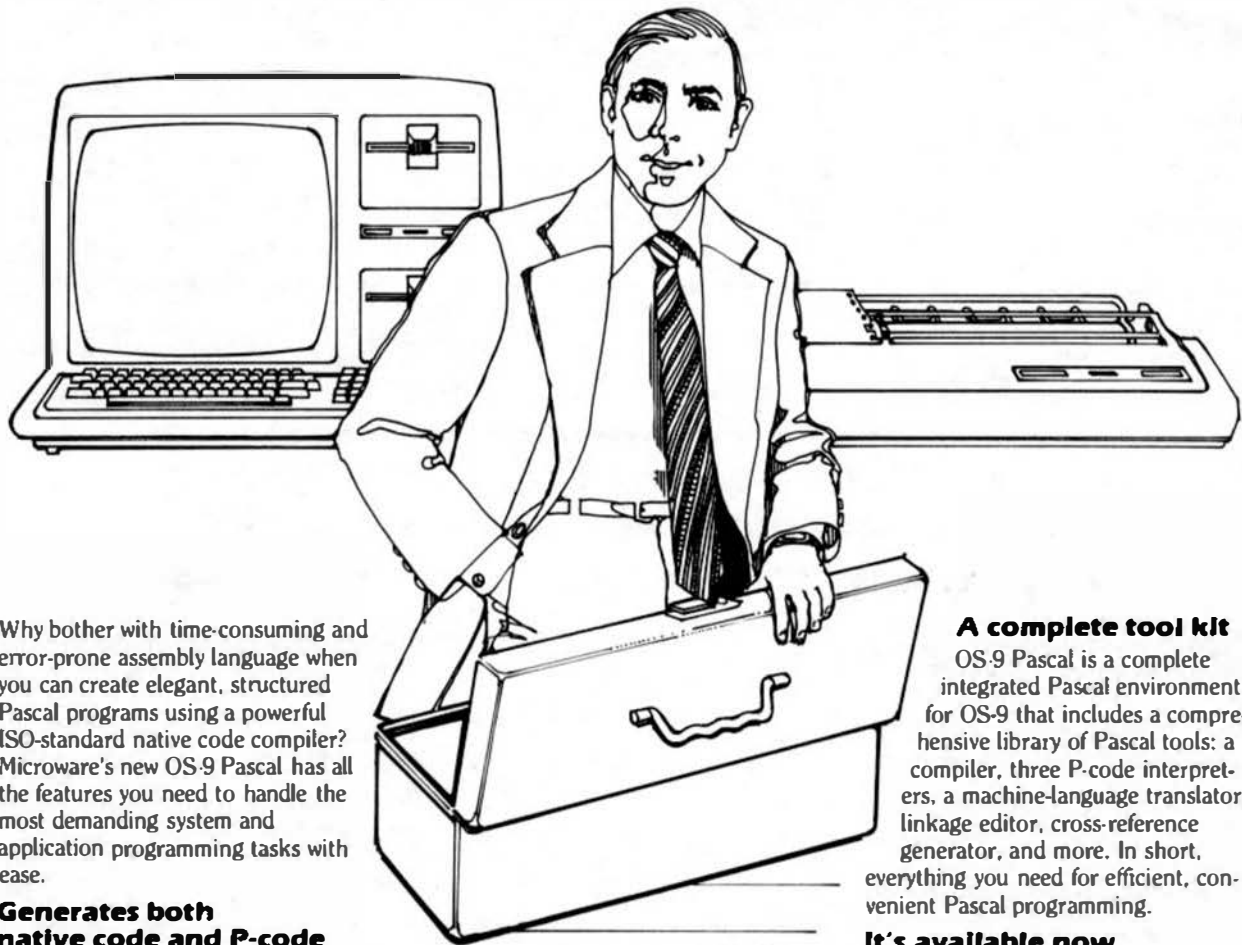
### MICROWARE®

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5835 Grand Ave., Des Moines, IA 50312  
(515) 279-8844 Telex 910-520-2535



# OS-9 PASCAL™

## A New Programming Tool For Experts



Why bother with time-consuming and error-prone assembly language when you can create elegant, structured Pascal programs using a powerful ISO-standard native code compiler? Microware's new OS-9 Pascal has all the features you need to handle the most demanding system and application programming tasks with ease.

### **Generates both native code and P-code**

With OS-9 Pascal you don't have to make that difficult choice between easy-to-use P-code Pascal or fast native-code Pascal. You can compile your Pascal program to pure 6809 assembly language source code. OS-9 Pascal performs extensive local and global code optimization which results in incredibly fast and compact machine language programs. Or if you prefer, OS-9 Pascal can generate P-code for interpretive execution to simplify program debugging and testing. There's also a Virtual Memory P-code Interpreter that can run huge Pascal programs that other microcomputers can't touch. In fact, you can run programs using any combination of P-code, compiled machine language, or handwritten assembly language procedures.

### **ISO Standard Pascal Plus**

OS-9 Pascal conforms to the ISO industry standard for Pascal, so you are assured of portability to or from any other computer that uses standard Pascal. OS-9 Pascal protects your software investment and gives you access to a vast body of existing Pascal software. Beyond the standard, we've added natural extensions to OS-9 Pascal to make it even more versatile, such as: relaxed identifier syntax; separate procedure compilation; random access file and interactive I/O; bitwise logical operators; run-time error handling; and much more. And because it runs under OS-9, it is inherently multiuser and multi-tasking.

### **A complete tool kit**

OS-9 Pascal is a complete integrated Pascal environment for OS-9 that includes a comprehensive library of Pascal tools: a compiler, three P-code interpreters, a machine-language translator, linkage editor, cross-reference generator, and more. In short, everything you need for efficient, convenient Pascal programming.

### **It's available now**

OS-9 Pascal is now available *off-the-shelf* in all OS-9 disk formats. It can be used on any disk-based 6809 computer running OS-9 Level One or Level Two. Each OS-9 Pascal package includes the compiler, machine language translator, P-code interpreters, run-time support packages, linkage editor, demonstration programs, and a comprehensive 120-page User's Manual. Write or call for our free catalog. We accept phone orders and MasterCard and VISA orders.

OS-9 Pascal and OS-9 are trademarks of Microware.



## **MICROWARE.**

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# Does timesharing on a small system make sense? It does with OS-9 Level One!

Now two (or more) acts can share your microcomputer stage. You will no longer have to walk away from your computer while it is busy running a long program. Because OS-9 is a multitasking operating system, you can be running a BASIC program while editing a PASCAL program, for example. This lets you make more efficient use of your time and your system, even if you only use one terminal. If your application requires multiple, independent terminals, one OS-9 system can do the work of several single-user systems.

## The convenience of an advanced operating system

Sophistication does not require complexity. Many OS-9 users say that it is actually easier to use than the older 6800-type operating systems. Consider how easy it is to run multiple programs: to run a program you just type its name and hit 'return.' To run a program as a separate job, you type its name, an '@' character, then hit return. The program runs as usual, but OS-9 comes back immediately and is ready for your next command. Simple commands let you see each program's status, set its priority, or abort it.

The file management system has fast, byte-addressable random-and sequential-access files. The tree-structured multiple directory system lets you create separate disk directories for each user, project, or application. Command line I/O file redirection means you specify what device and/or files a program will use when you run it, not when you write it.

## Efficiency and hardware versatility

No other operating system can run on such a broad range of hardware: the overall RAM requirement for Level One is 32K to 56K RAM. Memory utilization is superlative because OS-9 lets multiple tasks "share" the same reentrant program. For example, if two users run BASIC@9, only one "copy" is actually loaded into memory. The Level Two version of OS-9 can utilize up to a megabyte of memory on systems having memory management hardware (both versions come with complete timesharing support).

OS-9's device independent I/O system can handle almost any number and combination of I/O devices: five or

eight inch diskettes, winchester disks, disk cartridges, serial and parallel ports, memory-mapped video displays, and more. Microware offers a large selection of "stock" device interface software modules, or you can create your own: all the information you need is in the manuals.

## Excellent support and documentation

Each OS-9 package comes with a User's Manual and a System Programmer's Manual that cover every aspect of OS-9. If you have special requirements, you can even purchase the Source Code for most of OS-9 and related software. At Microware we take pride in offering the best customer support in the business. Technical advice and assistance by phone, mail or telex is available during all business hours.

## Superb software tools

In addition to BASIC@9, Microware offers: PASCAL, Interactive Assembler, Macro Text Editor, Stylograph, Word Processor, Interactive Debugger, and coming soon, COBOL, and C language compilers.



## BASIC@9 has a dual personality. One craves meat-and-potatoes BASIC. The other prefers Programme ala Pascal.

Some people say BASIC@9 is really a PASCAL in disguise, others say it's still BASIC. You'll understand this delightful dilemma when you look at both versions of the "bubble sort" program shown below: both can be run by BASIC@9. The program on top is unstructured and hard to understand, but it's traditional BASIC. The program on the bottom is well-structured and easy to follow, a virtue of PASCAL. With BASIC@9 you can program either way, or mix the best of both. It's like getting two languages for the price of one.

SORT AN ARRAY IN ASCENDING SEQUENCE	
90	DIM A(5)
100	I=5
110	IF I=1 THEN 200
120	FOR J=1 TO I-1
130	IF A(J)<A(I+1) THEN 170
140	T=A(I+1)
150	A(I+1)=A(J)
160	A(J)=T
170	NEXT J
180	I=I-1
190	GOTO 110
200	RETURN
DIM array(5)	
outer=5	
WHILE outer>1 DO	
outer=outer-1	
FOR inner=1 TO outer	
IF array(inner)>array(inner+1) THEN	
temp=array(inner+1)	
array(inner+1)=array(inner)	
array(inner)=temp	
ENDIF	
NEXT inner	
ENDWHILE	
RETURN	

## Makes programs better

BASIC@9 has five kinds of loop structures: WHILE...DO, REPEAT...UNTIL, LOOP...ENDLOOP, FOR...NEXT and IF...THEN...ELSE. If one of the five built-in data types (byte, integer, real, string, and boolean) doesn't suit the problem, you can make a new one of your liking with the TYPE statement. Need a tree, linked list, or symbol table? Complex non-rectangular data structures using any combination of data types are easy to define. Modular programming breaks down large programs to smaller, more manageable elements. BASIC@9 or machine language recursion plus parameter passing to any other BASIC@9 or machine language procedure. There is a complete set of statements for device-independent sequential or random I/O, plus a superlative PRINT USING system.

## Makes programs faster

No full-feature BASIC for any 8-bit microprocessor is faster than BASIC@9, because it is an interactive compiler. As each program line is entered, it is instantly compiled to a smaller, faster form. Because BASIC@9 automatically converts programs back to original "source" form for listing, it is as friendly and easy-to-use as traditional interpreter BASICs. Each procedure can be independently compiled to position-independent, reentrant, ROMable format. Microware developed a new ultra-fast 9-digit-accuracy floating point math system just for BASIC@9. And if that's still not fast enough, there's BYTE and INTEGER arithmetic.

## Features that make programs easier to write

The compiler is integrated with a

full-feature string AND line-number oriented text editor. If you make a mistake, BASIC@9 tells you instantly. String-oriented commands such as search, change, change all occurrences, delete, and insert can be used on programs with or without line numbers. There's an automatic line renumbering function too.

## Features that make programs easy to test

Debugging often takes longer than writing a program. That's why BASIC@9's integral high-level debugger sets it apart from all other compiled OR interpretive languages. The TRACE command shows you each statement executed in BASIC form, plus the result of any expression evaluation. STEP lets you run one or more statements at a time. LET and PRINT allow you to examine or change the values of variables, by name. STATE lists procedure calling order. And there are nine other debug commands. If you need to correct a program, you can edit, recompile, and rerun it in seconds.

Microware software is available for most popular 6809 computer systems.

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**TM Dataman+**  
DATABASE MANAGEMENT

# ONE PROGRAM THAT DOES IT ALL!

DATAMAN+ combines the capabilities of DATAMAN, DATARAND and DATACALC. It has been redeveloped from the ground up after over 12 months of experience with the DATAMAN system. DATAMAN+ is a powerful RANDOM Database Management system under FLEX, UNIFLEX and OS-9.

DATAMAN+ is for BUSINESS systems with 56K user ram. You can use DATAMAN+ for inventory control, work scheduling, mailing lists, sales reports and much more. The powerful report writer lets you create invoices, statements, form letters, and any other type of report your business needs. You can perform calculations with your data and print out the results. Special printer handling allows use of any size column output, not just 80 and 132.

DATAMAN+ is password protected at the menu level so that redundant password prompts are eliminated. We've added the human touch with the use of the operators name and calculator style input. DATAMAN+ checks for valid data types on input thus eliminating erroneous data in your database.

DATAMAN+'s report writer has added intelligence so that separate select programs need not be run to create different reports from the same database. As a matter of fact, the report writer is so flexible that you can use it to create invoices, statements, even form letters using data from the database. You can even perform calculations with the data and put the results in the report.

Setting up your system to run DATAMAN+ is very easy and automatic. The entire system has been designed with the inexperienced user in

mind. The operation of the system is so easy that although a manual is provided none is required to run DATAMAN+.

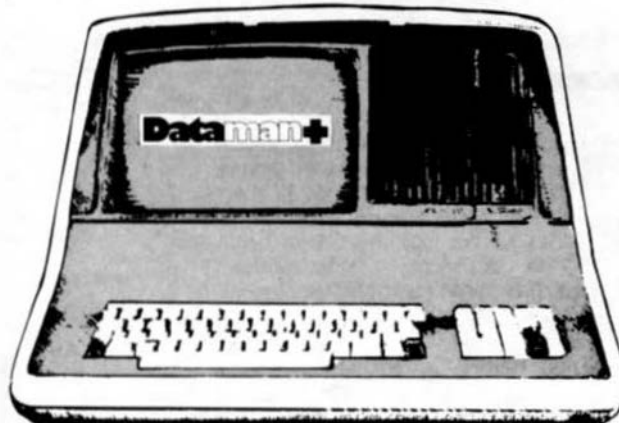
It's easy to create databases and reports with DATAMAN+. Full editing capability has been added to make it a snap. DATAMAN+ is the first truly RANDOM DBM system to allow any size record and any number of fields.

Modifying DATAMAN+ is easy because DATAMAN+ comes with every line of source on disk! and an easy to use manual with sections on each program for the programmer who wants to make modifications or customize it.

An upgrade will be available for users with DATAMAN.

**FLEX version available in December. \$199.95**  
**UniFLEX and OS-9 versions soon thereafter.**

**ONE PROGRAM  
THAT DOES IT ALL!**



**FRANK HOGG LABORATORY, INC.**

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# TOOLKIT NO1

The Basic Programmers Toolkit by Dick Bartholomew

The Basic Programmers Toolkit gives the BASIC programmer the power and flexibility never before achieved under FLEX. The features include:

## EDIT

Edit any in memory BASIC program while in BASIC! The editor appends to TSC BASIC or can be called from disk when you load BASIC into memory. It allows editing any line of your program! It automatically relocates itself to the top of memory. Totally invisible when not in use, it can even be used to enter new lines into your program. Its commands are: move cursor left or right, delete or insert characters, change string to string2.

## DECDMPIL

Change BAC files to BAS files! The Decomiler takes BAC files and creates a BAS file that can be modified and then recompiled. This is very useful for making small changes to programs that you don't have the BAS type file for. You can save the output to the printer or disk.

## XREF

Cross reference for BASIC programs! The Cross referencer is an invaluable tool for finding targets for GOTO's, and GO TO's plus all the variables and where they are used.

**PRICE \$49.95 object only \$69.95 with source on disk!**

# TOOLKIT NO2

The Programmers Toolkit by Dick Bartholomew

The Programmers Toolkit is a package of utilities and programs that extend the capabilities of FLEX to the utmost. The programs are:

## REPAIR

Repair any sector on a Disk! Repair gives you the following options: Read, Write, Find a byte, Display, Empty, Next in chain, Next sequential sector, Change drive number and more.

## SEGMAP

Graphic display of the sector fragmentation or scattering of a disk file or the free chain on the disk. This is done with a Graphic display on the terminal. See LINKMAT.

## LNKMAT

Sort and reformat the free chain into sequential order! LNKMAT will reformat the disk's free chain into sequential order. If you do a lot of editing or deleting of files this will speed access time by reducing seek times. This often eliminates the need to format a new disk and copy files from one to the other.

## FOIR

Full Directory program! DIRFO fills the screen with all the information about your disk, such as: Name, Date, # of Files, Largest, Smallest, Free space, Linked filename, Format of the disk plus more.

## MAP

Display the addresses of a file! Display the lowest address, Highest address, size in bytes, Transfer address, start of record indicators and more.

## CUSTOMID

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*Purchase Order	TSC X BASIC		49.95
*Income/Expense	TSC X BASIC		49.95
Basic Prog. Toolkit	TSC X BASIC		169.95
Password Protection	6809 ASMB	\$49.95	69.95
Extended Utilities	6809 ASMB	69.95	89.95
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Ether	6800/6809 ASMB	49.95	589.95
Readtest	6800/6809 ASMB	39.95	59.95
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Oynasolt Pascal	6809	29.95	49.95
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# X-FORTH

## FLEX COMPATIBLE FORTH

BY Chuck Eaker, Ph.D.

### X-FORTH NOTES

If you are considering buying FORTH, You are probably trying to decide which of the two available for 68XX to choose. Here are some of the major differences between the two. Unlike the other FORTH, X-FORTH runs in the FLEX (or OS-9) environment and uses the same files as any other FLEX program, which makes it compatible with other programs or utilities you may have.

X-FORTH at \$149.95 is more or less the same package as the other FORTH costing \$250.00. X-FORTH is about 25% faster, although exact timing tests haven't been run yet. It is faster because many of the important things are coded in assembler, not high level FORTH.

X-FORTH documentation is undoubtedly the best available for any FORTH on any computer. The manual is divided into four major sections: (1) Tutorial on FORTH in general; (2) Extensions added for flex; (3) Users manual; (4) Glossary which lists alphabetically all the words described in the users manual with complete description.

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by Dick Bartholomew

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# Flex User Notes

Ronald W. Anderson  
3540 Sturbridge Court  
Ann Arbor, MI 48105

## CAUGHT BY MY "GOTCHA"

The other day I received a letter from Bob Reimiller of OmegaSoft. Bob was rather gleeful at having caught me in an error, sort of said "at last I got you on one!" It seems that my (and his) first tries at Arcsin and Arccos functions have struck out. I'm going to go off on a little diversion this month, and hope that most of you have been through High School Algebra and Trigonometry (and remember enough of it to follow this). All of the trigonometric functions are repetitive in such a way that for a given valid value of the function, there are two angles within plus or minus 180 degrees ( $\pi$  radians) from zero, where the function takes that value. For example,  $\sin(\pi/4)$  is 0.7071.  $\sin(3\pi/4)$  has the same value. There is therefore an ambiguity in the function Arcsin. Is Arcsin(0.7071)  $\pi/4$  radians or is it  $3\pi/4$ ? By convention, we use the smallest of the two possible values. So far, Bob's and my solutions are perfectly acceptable. Where our equations fail is for negative values for the Sine of the angle. Arcsin(-0.7071) should yield  $-\pi/4$ . Ours both ignore the sign of the value and yield  $\pi/4$ .

Arcsin means "the angle whose sine is". That is, Arcsin(X) finds the angle whose Sine is X. The problem is that both of our solutions use X squared wherever X occurs in the equation. -0.7071 squared is 0.50, as is +0.7071 squared. The sign of the original Sine is therefore lost. I tried something this month that I have never done previously. I have shown where these equations come from, and indicated that they are all equivalent except for the sign problem mentioned above. I've done that by means of my awful handwriting, since I don't have a fancy printer that will allow superscripts and subscripts. These derivations come from a known and easily proven trigonometric identity that states that for any angle A,  $(\sin(A))^2 + (\cos(A))^2 = 1$ . Another better known identity is used also. It is the fact that for any angle A,  $\sin(A)/\cos(A) = \tan(A)$ . We have an Arctan function available, and if we can somehow transform the Sine of the angle into its Tangent, we can use Arctan rather than Arccos to find the angle. It should be fairly obvious that since  $\arctan(\tan(A)) = A$ , and  $\arcsin(\sin(A)) = A$ , we can substitute one for the other. Since Arcsin and Sine are "inverse" functions, if we say that  $A = \arcsin(X)$ , that implies the inverse, or  $X = \sin(A)$ . See my handwritten efforts for the remainder of the derivation.

You will note that Bob Reimiller's bad solution involves squaring X only once, while mine involves doing that twice. Bob's bad solution is therefore better than my bad solution. The derivation for the Arccos for the bad solutions follows a similar line of reasoning. The good Arccos solution follows rather directly from the fact that  $\cos(X) = \sin(\pi/2 - X)$ . Yes, Bob, you really did get me on that one!

## MORE ON MAGIC SPELL

Peter Stark has added a few new features to Magic Spell. Now, you can make corrections as Magic Spell finds the errors for you. It allows you to stop and type in the correct spelling. When the dictionary search is completed, the file will be read automatically and the corrections inserted as a new file is written with them included. The original file is not altered or deleted. Peter, it just keeps getting better and better! I understand that the dictionary has been expanded considerably too.

## STYLOGRAPH 2.0

I mentioned a new version of Stylograph being in the testing phase recently. I've received the final version just a week or so ago, and have found it to be very nice. Several new features make it even more in the way of a word processor than it was previously. There is an easy way to do a single character overlay and a single character insert. Previously it was necessary to type several keys to insert or change a single character, probably one of the most common actions in correcting typographical errors. In this new version, the cursor is placed over the letter for overlay, and a 1 is typed to signify a single character overlay. The correct key is then typed and the substitution is made. Typing a "up-arrow" sets up a single character insert just before the character where the cursor is positioned. These additions greatly facilitate error corrections for one who hits as many wrong keys as I do.

One new feature is the ability to edit files longer than memory via a NEW command. The NEW command empties memory to the page boundary nearest the cursor and fills the edit buffer again from the source file. It has been made impossible just to erase the buffer and fill from the source file. This makes it impossible to Print a long file (or just to look at all of it) without actually editing it. That is, to put a new part of a file into memory the old part must be written to a file. Since NEW observes page boundaries, this is not really too much of a bother with regard to printing a file. It is possible, during editing of a long file to write it out to two or more smaller files. It may then conveniently be split at page boundaries.

It is a better practice to break a long text file into several smaller ones anyway, for ease of editing. Chapter or sub chapter divisions are most natural.

Stylograph also has some new HELP features. A control A will get you a menu of several types of command lists. Select the one you need, and the commands in that category are displayed on the screen for you to look at. An Escape gets you back exactly to where you were when you asked for help. You may also at any time while in the command mode, call a FLEX utility such as CAT, for location of a file name, etc. An escape there also gets you back to the Stylograph menu. Though I still don't think Stylograph is the best editor for Programming (writing programs in Assembler or high level language), I find myself using

It exclusively for letter and report writing. The one feature I like best in Stylograph for writing letters and reports, is that it indicates the end of a page, and you can see where the paging breaks the text and make changes as required (for example by paging early to avoid having a paragraph or table split at an awkward place.) It seems that when I can't see where I am on a page, about 75% of the time, I end up with one line and my signature on the last page of a letter. With the page break displayed, I have a choice of removing a few lines or writing another paragraph or two to make some use of the new page before I end the letter.

#### WHAT'S NEW WITH ME?

I've been doing a lot of writing for my book, and by the time you read this, I should be sending the manuscript off to the publisher. In the process of writing about Pascal, I've of course had to explore the use of all its features. Frankly, I was a bit scared of POINTER variables, but I learned about them after consulting several sources, most of which either avoided the subject or had very little to say about it. The best source I found was the Jensen and Wirth Standard (1) Wirth's explanation was the clearest and easiest to follow. After three or four readings, I wrote a program using pointers, and it worked! I'm no longer afraid of string manipulations in Pascal either.

I have been programming a great deal for my work in Pascal also, though Assembler is still necessary for hardware interfaces. I'm anxiously awaiting a "C" compiler to try out. I have a book called "C Notes" that describes the language, and it does look interesting, though I am a bit puzzled that standard "C" doesn't do any overflow checking for either integer or Real arithmetic. A full C compiler ought to be a lot of fun to use. It is a bit less wordy than Pascal in that { replaces BEGIN and } replaces END. One thing I don't like about most of the languages is the effort required to print a blank line. PRINT in BASIC is not too bad. WRITELN; in Pascal is eight characters, but in C it takes printf("\n"); which seems like the height of something or other to me. One would think that a language designer who replaced END with \ could do better than 13 characters for a blank line!

Well, I guess with the derivation for ARCSIN here, I've pretty well filled my allotted space for this month.

See page no. 28

## COLOR User Notes

ROBERT L. NAY  
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Gadsden, AL 35903

#### GENERAL

Let's begin this month with some general comments concerning the Radio Shack Color Computer. I have been told that over 200,000 of these Computers have been produced (sounds high to me), and that over

75,000 have been sold in the USA (I think this is pretty valid). That means there are A BUNCH of users learning the 6809 chip, providing a major base of potential SS-50 Buss users. Another interesting thing I have noticed, while working with this column, is that a lot of the owners are technical and scientific type people. Therefore, there are two major groups of owners; the "Toy for games" users and those who have purchased a Radio Shack Color Computer to use either as a stepping stone in learning "Computers", or to put it to serious use as a working machine. Also obviously, many of the "Toy for games" owners are going to discover it's power and begin "the Quest", too. This makes the Color User Notes column extremely difficult to write; there is no clearly defined group of readers.

"Mail Call" has pointed up this variety of '68' Micro Journal readers — most of you old-timers would be amazed at the spread of knowledge of the Magazines' subscribers. Too those of you who might feel that a question is too "simple", or "stupid", just think about how many of these Computers have been sold in the FIRST YEAR of sales, and I'll GUARANTEE that there are THOUSANDS who have that same question. YOU have just advanced far enough to "know what question to ask"; think about it! All I'm saying is don't hesitate to ask, that's the only way to learn. Too the "advanced" users, many thanks for your input and comments. Some of your questions take some real "digging"; I learn from them also. We'll do our best to either provide an answer, or try to point you in the right direction.

Radio Shack now has their 32K Memory Mod available (for those who believed them when they said it was impossible to go above 16K). This Modification is not cheap, but it does add some more shielding for the earlier model Computers, I'm told. I haven't seen any Mod Instructions or updated schematics yet, so don't have firm details. The 32K Installation requires some Memory Chip lead reconfiguration in that 5VDC only, 64Kx1 bit Motorola chips are installed. These chips are really only 32Kx1; they are 64K rejects which have a bad bank, leaving half of the chip good. There is nothing wrong with them, they are just 32K chips. The procedure of selling these 32K chips provides lower prices for both 32K and 64K chips from a Manufacture, as they still realize some profit from what would normally be waste. A change in the Memory Configuration jumpers is required, as the early model Computers only have a 4K/16K option. This should make replacing these 32K chips with full 64K chips fairly easy — again, schematics are needed.

The Radio Shack Disk System has been delayed; you may have seen them in the Stores around the first of November. They had two problems appear; 1. Some of the Early-Model Computers were excessively noisy and require some more shielding (I haven't been able to get a Serial Number range of the affected units yet — I have the impression that some have the problem and others don't), and 2. they are experiencing an extremely high failure rate on one of the support chips in the ROM-Pack. They have recalled all Systems from the Stores, and told Service Centers



not to expect parts until mid-Dec. I have seen a system and glanced at the Manual (by the time you read this they should be readily available, this is being written in early Nov.). The first thing that hit me was that they use the "granule" idea from the '80 series Computers for Disk Storage, and the MINIMUM file space storage on a Disk is 2K Bytes. That's going to mean a lot of wasted Disk space; 2K is a large program for many users, especially if you are working at the "subroutine" or "module" level for utilities, etc. The DOS is in a ROM located at \$C000 (the Cartridge Slot), and supports both Sequential and Random Files. At a quick glance, the commands and operation looks fairly complete - we have an Evaluation Unit coming when they get them operational and will give a full report as soon as possible.

Some of you may have noticed a Version 1.1 BASIC ROM in later model Computers. If you have EXTENDED BASIC you will not see the V1.1 because you get EX. BASICS logo at Power On. Again, time has not let us dig into it yet, but it has some differences. The first (and easiest way to see which you have) difference is that the RESET Vector at \$BFFE/\$BFFF in the one I got a look at points to \$A227, instead of the \$A027 we are used to using. \$A027 must contain a jump or something, because the two have to be, and are, compatible in operation. The only thing "released" about the differences is that V1.1 has an 8-bit Serial Output format for the Printer, and that the "Fire Button" can not be used on some of the ROM-Packs (CHESS is one). This last item could also be tied in with the 32K Mod because the Memory Jumper feeds thru one of the PIA's and may be using that output?? (Sure is a lot of maybes, haven't checked, etc., isn't there? As I said, time just hasn't allowed much investigation yet; I've just run up a \$200 plus phone bill getting this much information - also see the RUMORS section this month - so we can keep you as up-to-date as publishing lead time will permit.)

I received a letter from a "Professional Wordprocessor" man yesterday; he provides a strong case in support of the keyboard on the Color Computer. I whole-heartedly agree with him; this is a GOOD Keyboard, it is just lacking in the number of Keys. I also like the "feel" and "stroke" of the Keys since I have solved the plastic to plastic sticking problem with the Powdered Graphite. I will let him tell you in his own words in the near future; I've requested that he furnish his thoughts in an article for the Magazine. He did bring up one point that I haven't run into, although I have considered the possibility. He types EXTREMELY fast and often has a missing letter, usually at the beginning or end of a typing "burst", as he calls it. There is a problem in the BASIC ROM Operating System in the Keyboard Routines in that, if you press two keys in the same PIA Decoding Column, you will only get one of them processed. They are both entered in the "rollover table" at \$0152-\$0159, but one is lost. If you are experiencing this problem, try reducing the "Debounce Delay Constant" at \$011B to provide less than the established 10ms delay and see if this helps; as I said, I'm not that skillful on the Keyboard to know if it solves the problem.

It appears that the character is picked up after the "debounce delay", but the table is not checked for remaining characters, so they are lost. Maybe shortening the delay will solve the problem; how far it can be shortened, I don't know. Let's have some feedback from some of you "Keyboard Burners".

#### FLEX on the COLOR COMPUTER

Look at this, all you Doubters (I don't think many of you readers fall into this category), this little "Toy" is purring like a kitten on TSC's FLEX (tm) Operating System (Is there really ANYONE reading this Magazine that doesn't know that FLEX is a Trade Mark of TSC's?). I have the first system developed by Steve Odneal (re. letter on p.19, Nov 81, '68' Micro Journal), and it's working like a CHAMP. We have the full Operating System for 5" Disks on FLEX09, including the Editor, Text Processor, and Assembler, running right now. This Column is being written with the Editor and Text Processor; I have run a 1K Assembly on the Assembler, no real problems anywhere. I've had it "up" a little over a week, so we obviously have a lot of running to do to really check it out, but to say I'm happy with it now would be the understatement of the Century.

My Computer System is configured as follows:

1. R.S. Color Computer with "piggy back" 32K Mod (ie., 4116's stacked on top of each other) with a Version 1.0 BASIC ROM and EXTENDED BASIC. .|| 2. EXATRON Memory Expansion Unit with their Disk Controller. (This will provide the extra 16K for the 32K system I have "piggybacked" if you don't already have the extra memory.) .|| 3. Two 35 Track 5" Disk Drives (Standard SA 400 type). .|| 4. Steve Odneal's conversion of the GENERAL FLEX OPERATING SYSTEM. .|| 5. EPSON MX-80 Printer with the 8150 (2K Buffer) Serial Adapter Card and their GRAFTRAX ROM set. The unit is set up to run at 2400 Baud. .|| 6. RCA XL-100 13" Color TV set (THAT should have no effect on FLEX, but now I have an out if things don't go so well).

So far, the total "bugs" consist of ONE; every once in a while, the Text Processor shifts a line one character to the left, causing the loss of the first character and a char. space at the end of the line. If that ends up being the sum and total of the problems, I will be AMAZED, but so far, so good.

Steve performed the normal Disk Driver and Console Routine modifications, and developed the Boot System to operate thru the EXATRON DOS ROM. Boots are problem free. He solved the bottom page (or low memory) conflicts by starting all FLEX Programs at \$0600 (right above the Color Computers' Screen Memory). This required some major work on some of the Programs (CMD's), but the PIC programs are straight-forward. I now have the DYNAMITE Disassembler from COMPUTER SYSTEMS CENTER running; all it required was a simple relocation to start at \$0600 instead of \$0000. Pete Stark of STAR-KITS has "lifted" his "Magic Spell" program for this system, so you should see a "magical" (bad!!)

Improvement in my spelling next month. Not bad, for a couple weeks operating time, huh? Still to go yet is interfacing this System into Radio Shacks BASIC Operating System and DOS (still waiting to see what it is). Right now, I can "JUMP" to \$A027 to get to BASIC, and "EXEC &HCD03" to get back to FLEX without losing anything from either System; i.e., they don't interfere with each other. The EXATRON Memory Expansion and DOS are what make it all "click"; their Memory Expansion board is designed to allow the ROM to be switched off and RAM activated for that Memory area thru software control. This allows a ROM Boot that lives in the FLEX Variable area; perform the Initial Boot, switch off the ROM, bring in the converted FLEX, and you're "up and running". Without the ROM Switch, either a Tape would have to be loaded to Boot FLEX or a "non-standard" ROM System would have to be installed. As the System is now, it maintains full R.S. compatibility.

Steve will be Marketing the System by the end of the year (meaning, by the time you read this); you'll see Ads, or drop him a line (address in the referenced letter in Nov 81 issue). It will probably consist of a Disk and Tape, and be designed for the EXATRON System. Work is already in process to use the RS DOS, but I think it will require replacing their ROM. First, let's see what they have (I'm sure you won't be able to switch their ROM to RAM, like EXATRON's, which will severely handicap a simple conversion).

#### GAME REVIEW

##### "BERSERK"

by MARK DATA PRODUCTS 43802 Barquille, Mission Viejo, Ca. 92691 (714) 768-1551 (evenings)

SYSTEM REQUIREMENTS 16K mem.; Joysticks; does NOT use EXT. BASIC

Cassette Tape; \$24.95

BERSERK is the first GOOD game I have seen for the Color Computer. It comes on a "load-and-go" Cassette Tape, and makes excellent use of the Color Computers' Video and Audio capabilities. The program shows an attention to detail that has been sorely lacking in most of the Game Products that have come out for this machine so far. Berserk utilizes a mix of Color Graphics and Sound with a challenging variety of situations which are molded into an outstanding example of "things to come" for the Color Computer.

BERSERK is a game in which you "shoot" your way through various rooms full of "robots". Obviously, said Robots are far from friendly; in fact, most are downright NASTY. Next, the walls of the rooms are "hot"; don't even brush them. Finally, just to add a little more spice to things, and to keep you on your toes, "SMILEY" is always lurking over your shoulder. "SMILEY" is a bouncing ball with a big smile on its face; your only escape from him is to RUN. "Sticks and stones", NOR your bullets, have any effect on him; Oh, and neither do the Walls.

Since Radio Shack was holding the price down on this computer, we don't have 3-D capability, so I'm just guessing, but it seems that HE can jump over the walls; as you've probably guessed by now, YOU CAN'T! You can outrun him; he can cut corners; guess who loses in a tie.

You are allowed 3 mistakes per game (You begin with 1/3 of a young cat's lives), and IF you can accumulate 5000 pts., you get another "life". Beyond that, the instructions don't say. (Poor reviewer that I am, I can't help much, either. You see, I haven't gotten THAT man yet, myself. I won't tell you my highest score so far, but it was somewhere between 4,099 and 4,101. Hopefully, someone in the audience will come to my aid and inform the expectant multitude of what lies beyond...) I suppose it is possible to clean all the rooms, but I doubt it. I haven't seen the same room twice in one game, but I suspect it would be full of "baddies" again, if you stumbled into it. Finally, just to keep you awake, "SMILEY" shows up quicker as you accumulate more points (at least, that's sure MY impression). You'll learn that there are times to "shoot first and ask questions later", and there are times to "duck quick and shoot straight"; all "SMILEY" accomplishes is to force a quicker decision.

As stated earlier, the attention to detail is excellent (re. the eyes of the Robots, for example). The mix of Audio and Video provides fluid action without "objectionable" delays in the motion of the game. BERSERK has enough variety in the different situations which, when combined with the sound and graphics, maintains interest over long periods of time.

All in all, BERSERK is an excellent game on the Color Computer. It is heartening to see a game with some "depth" to it, and is highly recommended when a break from "bug chasing" is needed. Without question, a AAA RATING.

#### PRODUCT REPORT

"MICROTEXT" by The MICRO WORKS P.O. Box 1110, Del Mar, Ca. 92014 (714) 942-2400

SYSTEM REQUIREMENTS Any Color Computer with a Cartridge Slot ROM-based Cartridge; \$59.95

Last month we mentioned the "VEDIO-TEXT" type Cartridge that The MICRO WORKS crew was working on. Well, it's "here already"; we recieved a unit to play with this week. It sure does solve most of the problems encountered with most of the other Modem/Terminal control systems we have seen. "MICROTEXT" is a ROMPACK which plugs into the Cartridge Slot on the Color Computer, with a short "pig-tail" cable connector sticking out the end of it. It contains a ROMed "Communications Program" which operates a Modem at 300 baud and provides Printer operation at 110, 300, 600, or 1200 baud. It also contains a "redefined" keyboard operation program which provides all 128 ASCII characters from the Color Computers' keyboard (thru the use of "Control Codes" for Printer and Program control). This allows the capability to control the display speed. Cassette Tape

operations, Modem Control, and Printer Control.

MICROTEXT provides several "special characters" that are often needed in communicating with other Computers, either through a Modem or when operating as a Terminal, and defines six other ASCII code chars. that are available to the user but do not display correctly on the TV Screen. The "down arrow" is defined as the Control Key, such that typing a "Control-C" (break) is accomplished by holding the "down arrow" key down while typing the letter C. The "CLEAR" key is defined as "escape" by MICROTEXT, while "Control-BREAK" is defined as (or outputs) a "line break" which is often used to attract a Computers' attention when using the Color Computer/MICROTEXT combination as a "Terminal". All program "operation controls" use a double-entry format to prevent obtaining a control accidentally. The top row of keys are used ("!" through "-") with the "Control" key; for example <Control 66> starts the Printer.

The MICRO WORKS' "MICROTEXT" has the capability of writing the received information to Tape for future use. The Tapes generated are standard ASCII data tapes which can be read with the Extended Basic statement "LINE INPUT" or by their SDS80C editor/assembler. A downloaded BASIC program can be read with the "CLOAD" command if every line has a line number. Other Controls provide control of the Display Speed, Redisplay Information, Modem control, Screen control, and, as mentioned before, Printer control. Also provided are a series of "Escape" controls for cursor, line, page, and editing controls.

The connector on the cable attached to the MICROTEXT ROMpack is the same as that in the Computer, allowing the use of any Printer that will operate normally on the Color Computer to be plugged into it with no changes. This also includes any Serial to Parallel converters, such as The MICRO WORKS PI80C.

The Documentation provided is typical of The MICRO WORKS Manuals, providing more-than-adequate information on the operation of the program. A Source Listing is available by request from MICROTEXT purchasers, and five "hooks" are provided from the ROM to allow user routine modifications.

This product from The MICRO WORKS fills another void in the area of "We sure could use something for this problem". The use of Modems and Computer Information Access Systems is expanding rapidly, and MICROTEXT allows the Color Computer to be of real value in this area by eliminating two of the major problems in using this Computer in CIS access or as a Terminal to other Computers. The Printer capability provides both a permanent record of information and eliminates the problem of trying to decipher 80 column lines with a 32 column system. The Tape capabilities allow bulk storage and access of the information gained from the system for later use. Finally, I, personally, would like to see their Keyboard System become a "standard" for Color Computer software; it allows full utilization of the restricted physical

Keyboard through the use of Control Codes and an Escape Key, and the choice of keys for these operations are natural and convenient.

Another EXCELLENT Product from the "gap fillers"; definitely a AAA Rating.

#### RUMORS

Let me start this off by saying that I have no SOLID PROOF for the RUMORS presented here. They are just that, RUMORS; but I think you'll find most to be fairly accurate. Some will probably be proven by the time this gets to print (again, this is early Nov., and things have been happening F-A-S-T the last several weeks).

First, I hear that the R.S. SCRIPSIT, or whatever the Wordprocessor will be called, has been recalled; reasons unknown, but I suspect one of two possibilities. Either the V1.1 ROM provides some possibilities we haven't discovered yet, or they want to adapt it to a ROM Pack with MEMORY, similar to what Computerware has in their PowerPack.

The Editor/Assembler was delayed to allow time to develop a larger amount of RAM to go into its ROM Pack; the numbers I heard were from 6K to 10K of memory will be installed. There is a clear 16K, minus 256 bytes, of room from \$C000 up, so they could have a 4K ROM and still have plenty of room.

The Color Computer "Group" at Tandy has been provided with a "Software Package" that begins to make use of some of the 6883 SAM (Synchronous Address Multiplexer) chips' capability. Whether it will be used or not is unknown, but the idea goes something like this — 1. Install 64K RAM, activate the bottom 32K. 2. Reset into the \$C000 ROM, which would; A. transfer the two BASIC ROM's down to the lower 32K, B. Boot the Initl Disk Sector down there also, and C. transfer control to that program. 3. The Booted Program would shut down all of the ROM's and bring up the top 32K of RAM, and finish Booting the DOS; which would, 4. bring the two BASIC ROM's back home into the activated RAM, and then 5. proceed to modify them as required for Version changes, System Configuration, etc. WILD; but eminently possible. The 6883 SAM has possibilities we haven't tapped yet, such as indirectly accessing 96K of RAM by switching the bottom 32K between two "pages". The POTENTIAL for this little "Toy", the RS Color Computer, is astounding. It is a simple matter to transfer the Display Screen memory up to the bottom of the I/O areas which begin at \$FF00, leaving almost the full 64K free; put a new Keyboard Routine up there, use the "page" switching capabilities, and you have at least 90K of memory to run about anything your heart desires, 58 to 60K that is DIRECTLY accessible for use. Dream on, you say. I'll bet we see it within a year.

If that didn't start you thinking, how about this. Most of that phone bill I mentioned was spent "chasing" the new "Super Color Computer" that is supposedly in development at Fort Worth. The "WORD" was that it was a TRS 80 Model II type system,



but that it was extremely powerful. I think you'll find that that was TRUE, but not with the 6809E chip. Yep, the new baby is using the 68000 to handle its "manipulations". If the ATARI/APPLE RUMORS turn out to be true, there is going to be a proliferation of 68000 machines come out within the next year. Look out SS-64 Buss, it's about to hit the fan.

CLOSE

Well, if this hasn't started the New Year off with a Bang, I don't know what would. Old '81 sure left hectically for me; I've just sent a Major Avionics Shop packing with two days notice, it's on the road right now headed for Florida. I'm taking a plane down tomorrow to see where we go from here; at least we sort of expected that sort of thing in the Air Force. Anyway, I don't know where I'll be writing this column from for next month. If things are out of control, I have a "backup", or alternate plan no. 463 which will pick up the slack if needed, so the Column won't miss a beat. Until then, hopefully the Post Office can keep up the trail, just give me a little slack in answering your letters. Again, send a Self Addressed, Stamped Envelope if you want an answer, and we'll scratch something out and get back to you.

Thanks for the letters you have sent, they provide a guideline for the coverage we'll give through the Magazine. We are working with some of the writers in developing future articles for '68' Micro Journal; keep them coming. The BASIC Operating System in this machine is extremely good, let's not just drop it. You, the readers, determine what gets published by the letters and articles you submit, so send them to the Magazine, or to me, but send them in. The next year is going to be something for the Color Computer, and I sure can't carry it alone, so drop us a line.

Again, many thanks, and let's make this a memorable year. Till next month, may all your discoveries be good ones.

RLN

## "C" User Notes

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From Ron Anderson's October FLEX USER NOTES. "Fortunately we don't all have to like the same things. The multiplicity of programming languages just means that each of us can find a suitable one for our own needs. Soon we will be seeing another language called "C". Some of us will like it and some of us won't."

From the author of C, Dennis M. Ritchie, as published in the July-August 1978 issue of "THE BELL SYSTEM TECHNICAL JOURNAL".

"C is a general purpose programming language featuring economy of expression, modern control flow and data structure capabilities, and a rich set of operators and data types.

"C is not a 'very high-level' language nor a very big one and is not specialized to any area of application. Its generality and an absence of restrictions make it more convenient and effective for many tasks than supposedly more powerful languages. C has been used for a wide variety of programs including the UNIX(1) operating system, the C compiler itself, and essentially all UNIX applications software. The language is sufficiently expressive and efficient to have completely displaced assembly language programming on UNIX."

These two quotes point out one of the dilemmas facing virtually all programmers. That is "what language should be used to accomplish any given task most efficiently". As Ron observed, there are many different languages available to the 68xx user. None are really suited for every task a programmer might want to accomplish. But can one at least come close? Yes, I think the C programming language can and does. And I hope to convince more than just a few of you that I am right. Why? Because maximum efficiency (and for the home user enjoyment) occurs when a language is working for you, not when you are trying to work around the language.

This series will attempt to introduce the you to the C programming language in a loose, conversational manner. Hopefully you will come away with a feeling for the flavor of C, and at least a rudimentary understanding of its syntax. For those of you who really plan to use C, the bible of the language is a book by Dennis M. Ritchie and Brian Kernighan called "The C Programming Language", published by Prentice-Hall. It is not only one of the best tutorials for the language, but Appendix A is the "standard" for the language.

C was developed at Bell Laboratories in the early 1970's, primarily as a systems implementation language. It's a language that is quite similar to Pascal in many respects. In fact in a recent comparison of the two, C was described as a version of Pascal that wasn't afraid to take off its coat, roll up its sleeves and get its hands dirty. The biggest difference to me, as a micro user, is that C is more expressive than Pascal (read that as less verbose!) and it allows you to get closer to the machine in a completely natural manner. Like Pascal, C is a pointer based language. Pointers are constantly being passed around, operated on, etc. In general, you can do more with pointers in C than you can with Pascal. C also has a much richer set of operators than Pascal.

What is a C program? Nothing more than a collection of subroutines, which in C are referred to as functions, that are tied together by a top level subroutine, the main program. All functions in C have the same format:

```
name(argument list)
{
    argument declarations
    {
        local declarations
        statement body
    }
}
```

The argument list and the argument declarations are optional, but must always match one for one. Note however that the compiler determines an argument's position on the stack by its position in the list, not by the order in which they are declared. Next comes the opening bracket, then the declaration of any local variables, then the body of statements to be executed, and finally the closing bracket. Two examples may help clarify a function's structure.

```
/*
convert an ascii string to an integer
no sign allowed, stops on first nondigit
*/
```

```
atoi(buff)
char buff[];
{
int i, n;

i = n = 0;
while (isdigit(buff[i]))
{
n = (n * 10) + (buff[i] - '0');
i++;
}
return n;
}
```

```
/*
test if a character is a digit
*/
```

```
isdigit(n)
char n;
{
if ('0' <= n && n <= '9')
return 1;
else return 0;
}
```

Parameters are passed to functions on a stack. The stack may be the system stack pointed to by SP or a user stack pointed to by UP, depending on the compiler. The parameters may be passed either by value(2) or by reference(3), with a few exceptions. If the data is a single object, such as an integer or character, then it may be passed in either way. If the data is an aggregate data type like an array, then a pointer to the object is passed. In C, it is possible to pass pointers that point to anything, including other functions. Parameters in the list are stacked from right to left, according to the C standard. Good compilers will do this, however the those that are available today stack them from left to right. The only drawback to doing it this way is that you have to play some games in your library code to make certain "standard" functions behave properly.

All functions in C return a value in one of the machines 16 bit registers, even though it may be garbage. This means that a function may be used anywhere that a variable might. So it's very common to see function calls like "func1(arg1, func2(arg2), func3(arg3))". The compiler would generate code that called func2 and func3 and then used their return values in the call to func1.

The functions that make up a C program can be spread across any number of files. It makes no difference to the compiler. This is a fantastic advantage, even without a relocating assembler and linking loader. For example, using TSC's macro assembler for the 6809, you can create a build file that is nothing more than a bunch of "LIB's" that bring in different files. These files would be the compiler's output for the various C modules. Therefore, you can write some functions in one file and compile them. Then write test drivers in another file to test them. When

you are happy that they are working properly, you can throw away the drivers without having to touch the file that contains the functions that you were testing.

A side benefit of this modularity is that C really lends itself well to top down, structured programming practices. A former professor I studied under once remarked "the art of programming is the practice of deferring decisions until they don't have to be made." This is a very succinct simplification of "step-wise refinement" which goes hand in hand with top down programming(4). Let's assume that you want to build a text editor. When you really boil an editor down, it just does three things, initialize itself and open any requested files, let the user edit the buffer, and finally, do some post-processing and write the buffer to an output file. So, let's write the main module that does just that.

```
main(argc,argv)
int argc, argv[];
{
setup();
if (argc > 1)
options(argc,argv);
cleanup(edit());
}
```

In this example main() was called with two parameters on the stack, a count of all the arguments in the command line that invoked the program, argc; and a pointer to an array of pointers, argv. For a 6809, integers and pointers are synonymous. Each pointer in the array points to one of the arguments of the command line.

The internal state of the editor is then initialized by setup(). Argc was then checked to see if the editor was invoked with any additional arguments. If so, argc and argv are then passed to options() which would redefine the state of the editor based on any option "switches" and/or open any input and output files.

Next a call is made to the post processing routine cleanup(). Note that it has the function edit() as its argument. Since any arguments must be evaluated before they can be passed, edit() is called. When the user is done editing, edit() is finished and returns an exit code to cleanup() which then does the appropriate postprocessing based on that exit code. Note that no intermediate variable was needed to capture the return value of edit() and pass it to cleanup(). At this point we could test the program with stubs(5) and then refine the functions later.

A comment. Those of you who actually go out and buy a copy of "The C programming Language" will notice that the formatting I use in laying out a section of code will differ from examples that you see in the book. Most of the differences will concern placement of the opening and closing brackets for functions and multiple statements. I happen to follow a "style" described by Whitesmith's, a very big name in C language circles. However, it makes no difference to the compiler. C is a most form free language. About the only restriction I am aware of regards how a compiler handles line breaks (in C terminology "newlines"). This is a compiler dependency. But for most compilers, splitting a statement with a newline will result in some sort of syntax error.

Speaking of compilers, what's around? Well, for the 6800, there is Tiny C by Tiny C Associates which is a non standard interpreted version; and there is a version sold by Wintek that runs on their Wizard

operating system. I know nothing about these two. For the 6809 there are two that you can buy today and one that should be available around January 1982.

As the saying goes "the best is yet to come." TSC is planning to release a complete implementation of the language for both UNIFLEX(6) and FLEX(6). The UNIFLEX version should be out around January, with the FLEX version following it by about 4 weeks. I talked with the folks at TSC and they assured me that if a feature was found in Appendix A of "The C programming Language", then it would be in their compiler. And they were also planning to include enumerative data types which are C's equivalent to Pascal's scalar data type. The compiler will be offered as a package along with their new relocating assembler and linking loader. If they do it right, it will be a very powerful addition to your software tool kit.

The two compilers that you can buy today are both subsets of the language. One is from Dugger's Growing Systems and the other is from Intersoft Unlimited. Both are in the \$75 price class.

Dugger's compiler was the first on the market for the 6809. It is essentially a one man effort. The first release came out around July. It supports only the data types char and int, its only looping mechanism is the "while", and the only conditional is the "if then else". On the other hand the compiler is very compact and you can compile small programs in as little as 16k of ram. The code that the compiler produces is reasonable compact and fast. It is not, as they claim, position independent there are some JSR's and some LDX's that use absolute addresses. The biggest problem with the package was the documentation and the user library.

The documentation did not adequately advise you on how the compiler differed from the standard. It also failed to completely explain the compiler's prompts. There were numerous errors of varying magnitude. The library, well I rebuilt most of it in order to get something useful. But I might have done something like that any way.

NOTE, in fairness to Dugger, I got one of the first copies (serial number 10). A lot may have happened since then. I can say that overall, the package is very straight forward and easy to use, once you figure it out for yourself.

The Intersoft compiler implements a more complete subset of the language. But it has some serious drawbacks also. The compiler is somewhat bigger than 32K. I wouldn't want to use it unless I had 56k of ram. The code it produces is not as compact or fast as that produced by Dugger's compiler. Their runtime support is very nicely done, but very big. I wrote simple program to calculate primes using the Eratosthenes Sieve algorithm. The binary from Dugger's was 6 blocks on the disk. The binary from Intersoft was 36 blocks. In fairness to Intersoft I should mention that a lot of that might be from their printf() function. Its assembler code alone was 57 blocks! Also a lot of their runtime was done in C instead of assembler code.

Both the Dugger and Intersoft compilers are modelled after Ron Cain's "Small C Compiler" that was published earlier in "Dr Dobb's Journal". It was written for the 8080. It was designed for a hypothetical machine that had two 16 bit registers, the primary and the secondary. Intersoft has followed that model, but unfortunately, the secondary register is implemented in memory! Dugger's did not go to that extreme, luckily. Other than that, they both act somewhat similarly. They ask you if you want the C code imbedded in the output code (as comments), whether globals are to be defined. That really means whether or not space will be saved for them via "RMB's". And they ask you what label to start on. Internally, they generate "loce1" labels in the form

"CCnnnn". If you are compiling the modules separately, you must define nnnn for each module such that they don't overlap and cause duplicate labels.

Well that's it for this month. In the next installment we will look at C's various data types, variable storage classes, and its set of operators.

### 3 NOTES:

1) UNIX is a trademark of Bell Laboratories.

2) call by value means to pass a copy of the desired variable, thereby protecting the variable itself from possible corruption.

3) call by reference means to pass the address of a variable so that a function can modify the variable directly.

4) Top down programming and step wise refinement refer to practice of breaking down a task into it's simplest or top most components and coding them with functions. Later the functions are refined or filled in.

5) Stubs are dummy functions that are called by a program that is being tested. They may be complex and report what got passed to them, or something as simple as a return statement.

6) UNIFLEX and FLEX are trademarks of TSC.

```
{
  # mc.txt      rev:1
  # n f commo  10,20,81
  #
  # This program keeps a tally of the characters, words
  # and lines that are fed to it. It works with STDIO
  # which must be redirected if using a file. The end
  # file character from the terminal is shift-control-Z.
  #
  # A word is defined as any single or sequence of
  # printable characters separated by space, tabs or
  # a newline.
  #}
```

```
program mc;
const
  CR = 13;
  TAB = 09;
  EOF = 0;

var
  c : char;
  nl, nm, nc : integer;
  inword : boolean;
```



```

begin {! main !}
  inword := false;
  nl := 0;
  nw := 0;
  nc := 0;
  read(c);
  while c <> EOF do
    begin
      nc := nc + 1;
      if c = CR
        then nl := nl + 1;
      if (c = ' ') or (c = CR) or (c = TAB)
        then inword := false
        else if not inword
          then begin
                inword := true;
                nw := nw + 1;
              end;
      read(c);
    end;
  writeln;
  writeln(nc:1, ' chars');
  writeln(nw:1, ' words');
  writeln(nl:1, ' lines');
end.

```

## SIMULATION, GAMES, AND RANDOM VARIABLES

by

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# Part III

If a period of length of  $M=32768$  is required, a non-zero value of  $C$  must be used, and  $A$  and  $C$  selected in accordance with the three conditions previously outlined for this case. Condition (A1) can be met by selecting  $C$  to be a prime number. Condition (A2) is easily met, since any even number is a multiple of 2, which is the only prime factor of  $M=32768$ . Condition (A3) must be applied, since 32768 is a multiple of 4. The values

$$A = 181; C = 3$$

satisfy these conditions, and a maximum period length of 32768 is indeed produced by these values. Note that  $C$  need only be odd to be relatively prime to 32768.

In a 32-bit machine such as the IBM System 370, two's complement notation results in a natural modulus of

$$M = 2^{31} = 2147483648$$

This might be considered to be a fortunate circumstance, since the integer

$$M - 1 = 2147483647$$

happens to be a prime number. In accordance with the previous discussion, the maximum period length is

$$2^{29} = 536870912$$

and any odd value of  $X_0$  will produce this length. Only odd values of  $X$  will occur in the sequence, as was discussed previously. A standard FORTRAN subroutine used with IBM Series 370 computers for generating random numbers is:

```

      IY = IX * 65539
      IF(IY) 5, 6, 6
5     IY = IY + 2147488647 + 1
6     YFL = IY
      YFL = YFL * 4656613E-9
      IX = IY

```

In this case,  $X_0$  must be odd so that the  $X$  values are relatively prime to  $M$  if the maximum length period is to be produced. Since  $65539 \bmod 8=3$ , the two necessary conditions are met. The variable  $YFL$  is produced by effectively dividing  $IY$  by 2147483648, producing a sequence of random numbers uniformly distributed between 0 and 1. This is the distribution normally desired.

The fact that the random integer generators just discussed produce only odd values of  $X$ , when used in a manner to produce the maximum period length, may lead to some question as to the randomness displayed. (If initialized with an even valued seed, they produce only even values with period length one-half the maximum.) The problem is even more serious than this, since it can be shown (Reference 1) that if  $M=2^e$ , then the low order  $n$  bits of  $X$  alternate with a period no greater than  $2^n$ . For example, the low order four bits alternate with a period of 16 or less, the low order 5 bits with a period of 32 or less, etc. Normally, this is of no consequence because the behavior of the low order digits do not significantly affect the application. This is especially true if the  $X$  values are divided by the modulus to produce random numbers uniformly distributed between 0 and 1. If such behavior is a problem, then a modulus equal to the maximum integer value plus or minus 1

can be used, which eliminates the regular pattern in the low order bits. An alternative is to select a prime modulus, which also eliminates the effect, but often at a cost in computational efficiency.

To this point, the generation of integers by means of the linear congruential sequence has been considered solely from the viewpoint of avoiding repetition in the values produced. While this is a very important consideration, it is by no means the only concern one need have about a random number generator. To illustrate this, consider the Gamblers Ruin problem introduced previously. A simulation of this problem using the random number generator for a 16-bit PASCAL machine is presented in Listing 5. Each individual play has its outcome determined by a single selection from the random number generator. The program merely repeats this process, accumulating the value of the remaining resources. When considering the play of a single game, the only requirement on the random number generator is that the selection be equally likely to lie anywhere in the range from 0 to 1. But when considering the overall problem of simulating the growth and depletion of the players resources, it is also important that the numbers be independent from one selection to the next. In fact, there should be absolutely no significant pattern in the values that the sequence produces, except for that governed by the periodicity of the random sequence. Thus the reason for the desirability of a large value for the period length. For example, since the player loses when his resources reach zero, any systematic pattern which produces several individual game losses in a row will tend to hasten the conclusion of his play. This merely reflects the real world situation which it is intended to simulate, since the probability of the outcome of any single game is independent of the results of any other game. Because the random number generator is used to simulate this situation, it must display the same characteristic.

To illustrate these concepts the reader may want to exercise the program of Listing 5 for the case of craps, where the probability of winning any game is .493. Note that the program simulates the play from 1 resources to either zero or K resources a number of times. This is a necessity, since the result of any single series of individual games is itself a

random event, and such a single result is useless in inferring the probabilities involved. Only when the results of many series of plays are considered can meaningful conclusions be inferred from them. In this particular case, the theoretical probabilities can be determined from the expressions presented previously, and it is interesting to compare simulation results with these theoretical values. Any long-term systematic differences imply troubles with the random number generator.

In the event that theoretical probabilities cannot be determined analytically, or such determination is beyond the mathematical sophistication of the person desiring the information, simulation may be the only means by which such information can be obtained. For example, the "system" described previously whereby the player "doubles up" after every loss can be simulated fairly easily, and the overall win probability determined from execution of the simulation a number of times. Listing 6 shows the minor modifications to the Gamblers Ruin simulation required to accommodate this "system." The wager amount BET is adjusted after every play, and if the amount of the wager required is greater than the remaining resources, the entire amount of the remaining resources is wagered. By exercising this simulation many times, one can infer estimates for the probability of winning any series of individual games. Before such inferences can be reached, however, one must have confidence in the random number generator used, from the viewpoint of both the distribution of the numbers produced (equally likely to lie anywhere in the interval from 0 to 1), and the independence of individual numbers (no systematic pattern other than the repetition period). The repetition period itself represents a systematic pattern which might produce a problem if the quantity of random numbers required approaches the period length.

To test a random number generator for a uniform distribution, one can generate a quantity of random numbers N and examine their distribution. This is usually done by dividing the range from 0 to 1 into M equal intervals, and then counting the random numbers falling into each range. The resulting histogram gives an approximation of the distribution of the random numbers. Such a histogram can be given theoretical significance by applying the

"Chi-squared" test of statistical inference. This is done by forming a "test statistic"  $S$  in the following manner. The expected number of values falling into the  $m$ -th interval is

$$E_m = N/M$$

since the interval widths are identical. If the actual number of values falling into the  $m$ -th interval is  $A_m$ ,  $S$  is determined by the expression

$$S = (A_1 - E_1)^2/E_1 + (A_2 - E_2)^2/E_2 + \dots (A_M - E_M)^2/E_M$$

In this case,  $S$  has a particular probability distribution termed a "Chi-squared distribution with  $(M-1)$  degrees of freedom." Consequently, probability assessments with respect to observed values of  $S$  can be made. For example, if there are ten intervals ( $M=10$ ), then  $S$  has a Chi-squared distribution with nine degrees of freedom. From a table of the Chi-squared distribution one can determine the following information relating numerical values to the probability that  $S$  has at least that value.

Probability	$S$
.99	2.09
.95	3.32
.75	5.90
.50	8.34
.25	11.39
.05	16.92
.01	21.67

For instance, the probability that  $S$  is greater than 2.088 is .99 if the sequence of random numbers truly comes from a uniform distribution. Thus, an observed value of  $S$  less than 2.088 would be sufficient to reject the hypothesis that the observed random numbers came from a uniform distribution, with only .01 probability of rejecting the hypothesis when it is actually true. A similar statement can be made concerning values of  $S$  greater than 21.67. The reader should note, however, that small values of  $S$  are caused by a tendency for the number of values falling in each interval to be very close to the expected number, while large values are caused by a tendency for some intervals to have much more than their expected numbers while others have much less. Either situation represents a non-probable result

if the numbers are random and come from a uniform distribution.

The Chi-squared test is actually designed to test a discrete distribution for which there are only a finite number of values which the random variable can assume. Random numbers generated on a computer approximate a continuous distribution (where there are an infinite number of possible values), but there are actually a finite number of possible values determined by the periodicity of the random integer sequence. A little thought will reveal that the Chi-squared test described above actually tests the ability of the random number generator to produce a sequence of integers uniformly distributed between 1 and 10. To test a continuous distribution (or a discrete distribution with a large number of possible values) a second test, the Kolmogorov-Smirnov test, is normally used. However, if the number of intervals in the Chi-squared test is large, it may be effectively applied to continuous distributions. The reader is referred to Reference 1 for a discussion of the Kolmogorov-Smirnov test and its comparison with the Chi-squared test.

A PASCAL program implementing the Chi-squared test for a uniform distribution of random numbers is shown in Listing 7. There are 64 intervals used, and the random number generator to be tested is contained in procedure RANDOM. The choice of 64 intervals is quite arbitrary, but the sorting routine requires a multiple of two. The threshold values of the statistic  $S$  (for 99%, 95%, 75%, 25%, 5%, and 1% confidence limits) are obtained from a table of the Chi-squared distribution with 63 degrees of freedom. This program is specialized to the uniform distribution on the interval (0,1). The reader is referred to Reference 1 for details of application to other distributions.

To exemplify some of the problems inherent in the use of pseudo-random number sequences, the reader should test the random number generator considered earlier,

$$X_{n+1} = 181X_n \text{ mod } 32768$$

for a sequence length equal to the repetition period (8192). Since all 8192 possible values occur once and only once in the



sequence, the histogram is perfectly flat with 128 counts in each interval. This will fail the Chi-squared test, even though the numbers produced are absolutely uniformly distributed, because such an occurrence is very improbable if the numbers are really random. Thus, as the number of test integers approaches the period length, the sequence will look less and less like it is random. In fact, a consideration in the application of the Chi-squared test is the selection of the length of the sequence to be tested. It has been empirically determined that the expected number in each interval should be at least 5 for good results. In general, however, the efficacy of the test increases as the sequence length increases. On the other hand, use of long sequences may tend to smooth over "local" characteristics. Probably the best technique is to use several different sequences of moderate length.

The Chi-squared test is appropriately applied only to sequences where the individual numbers are independent of one another. But this is the second characteristic that a random number generator must have for general simulation use. To test a random number generator for such independence, a battery of tests have been developed (Reference 1). Some of these are empirical tests (run on data produced by the random number generator) and others are theoretical tests based on the parameters used to produce the linear congruential sequence. They all attempt to assess the "serial correlation" of a sequence, the dependency of one value upon another in the sequence. A general treatment of these tests is beyond the scope of the present discussion, but one test will be considered.

In general, a member of a sequence can be correlated with its immediate neighbor, with its two immediate neighbors, and so forth. A standard approach in time series analysis to determine serial correlation is the use of the autocorrelation function, defined by the equation

$$R(k) = (1/(N-k)) \sum_{n=1}^{N-k} X_n X_{n-k}$$

$$- (1/N) \sum_{n=1}^N X_n^2$$

The value  $R(1)$  describes the correlation between a member of the sequence and its following neighbor.  $R(2)$  describes the correlation with the neighbor two numbers away, and so on. The correlation coefficient function

$$r(k) = R(k)/R(0)$$

is a normalized function used to describe the correlation in standard terms, and can have values only between -1 and 1. A value of one describes perfect correlation (the two numbers are totally dependent), while the value of zero implies independence. A value of -1 implies that the two values are totally dependent in a manner whereby large values of one number are associated with small values of the other. The values of  $r(k)$  which are "good," in the sense that they should not be used to disqualify a sequence, lie between the values

$$-1/(N-1) - (2/(N-1)) \sqrt{N(N-3)/(N+1)}$$

and

$$-1/(N-1) + (2/(N-1)) \sqrt{N(N-3)/(N+1)}$$

For large values of  $N$  (100 or greater) these limits reduce to

$$-1/N - 2/\sqrt{N} \text{ and } -1/N + 2/\sqrt{N}.$$

These values represent the 95% confidence limits, in that when resulting values fall outside their range, the hypothesis that the numbers are independent can be rejected with only .05 probability of rejecting a sequence which is actually independent (or more properly, uncorrelated).

To be continued...

## DISKFIX final

00010		NAM	DISKFIX2 Check & Repair Crashed Disk
00020			Rev 0.0 July 6, 1981
00030		OPT	0,MOG
00050		*External References	
00070	0000	TRACK	EQU 0
00080	0005	TEMP	EQU 5
00090	0006	CATENT	EQU 6
00100	0000	STATUS	EQU \$0
00110	0011	WMEH	EQU \$11
00120	0022	SAVEX	EQU \$22
00130	0020	COUNT	EQU \$20
00140	5200	DISKFX	EQU \$5200
00150	5205	DIRNIM	EQU \$5205
00160	5207	DISKAD	EQU \$5207
00170	5209	ADRLIM	EQU \$5209
00180	5200	ERRC	EQU \$5200
00190	5303	ADDS	EQU \$5303
00200	5338	DREAD	EQU \$5338
00210	5344	DWRITE	EQU \$5344
00220	A800	SFSB	EQU \$A800

```

00230 AC03 DEPTH EQU SAC03
00240 AC14 LBUFF EQU SAC14 Line buffer pointer
00250 AD03 WARMS EQU SAD03 FLEX reentry
00260 AD18 INBIFF EQU SAD18 Buffer input
00270 AD1E PSTRMG EQU SAD1E String output with CRLF
00280 AEA9 PSTRG1 EQU SAEA9 String output, no CRLF
00290 AD24 PCRLF EQU SAD24
00300 AD36 ADDBX EQU SAD36
00310 AD39 OUTDEC EQU SAD39
00320 AD3C OUTIEX EQU SAD3C
00330 E07E PDATAI EQU SE07E String output per XR

00350 *VALAD checks validity of a disk address

00370 5430 ORG $5410

00390 5410 DF 22 VALAD STX SAYEX XR has disk address
00400 5412 96 22 LOA A SAYEX Track
00410 5414 D6 23 LOA B SAYEX+1 Sector
00420 5416 27 0C BEQ VALERR B=0? Invalid.
00430 5418 B1 6E26 CMP A $6E26 In system record
00440 5418 22 07 BHI VALERR Bummer if greater
00450 5410 F1 6E27 CMP B $6E27 In system record
00460 5420 22 02 BHI VALERR
00470 5422 0C CLC No flags
00480 5423 39 RTS
00490 5424 0D VALERR SEC
00500 5425 39 RTS

00510 *LOCERR identifies track & sector error location

00530 5426 0D 09 LOCERR BSR DIRER1 Run text per XR
00540 5428 CE 5207 LOX #DISKAD Track & Sector
00550 5428 7E 5303 JMP ADDOS Output data

00570 542E CE 56B8 DIRERR LOX #DIRER1 "Directory error"
00580 5431 7C 520D DIRER1 INC ERRC Step error count
00590 5434 7E AEA9 PSTRP JMP PSTRG1 Run text

00610 5437 8D F8 COLERR BSR PSTRP "Collision with #"
00620 5439 DE 22 LOX SAYEX Points to Map address
00630 5438 5F CLR B No leading spaces
00640 543C 8D AD39 JSR OUTDEC Output number
00650 543F CE 560D LOX #ATTX "at"
00660 5442 20 E2 BRA LOCERR Name track & sector

00680 *COMPAD computes map address from Track & Sector

00700 5444 5A COMPAD DEC B B has Sector number
00710 5445 58 ASL B X2 Two bytes per entry
00720 5446 D7 23 STA B SAYEX+1 hold it
00730 5448 16 TAB Track number
00740 5449 5A DEC B B1-4C now B0-4B
00750 544A 4F CLR A No carry
00760 5448 59 ROL B
00770 544C 59 ROL B
00780 544D 49 ROL A
00790 544E 59 ROL B
00800 544F 49 ROL A
00810 5450 59 ROL B
00820 5451 49 ROL A
00830 5452 59 ROL B
00840 5453 49 ROL A
00850 5454 59 ROL B
00860 5455 49 ROL A
00870 5456 D8 23 ADD B SAYEX+1
00880 5458 89 58 ADC A #58 Get sector offset
00890 545A 97 22 STA A SAYEX Buffer starts at $5800
00900 545C D7 23 STA B SAYEX+1
00910 545E DE 22 LOX SAYEX
00920 5460 39 RTS

00940 *TRACE pursues 1 file to end or error

00960 5461 DE 06 TRACE LOX CATENT Directory entry
00970 5463 EE 11 LOX $11,X Length data
00980 5465 DF 04 STX TEMD-1 Reference register
00990 5467 DF 20 STX COUNT Working register
01000 5469 DE 06 LOX CATENT

01010 546B A6 13 LOA A $13,X Sector Map byte
01020 546D 27 02 BEQ #+4 B0? Sequential file
01030 546F 06 01 LOA A #1 Random file
01040 5471 97 0D STA A STATUS Correction for record #
01050 5473 EE 0D LOX $0,X Starting track & sector
01060 5475 8D 99 BSR VALAD Check it
01070 5477 25 05 BCS DIRERR Invalid data.
01080 5479 DF 00 TRACE1 STX TRACK Apparently OK
01090 547B FF 5207 STX DISKAD Where we are
01100 547E CE A800 LOX #SFSB File sector buffer
01110 5481 8D 533B JSR DREAD Data into buffer only
01120 5484 CE A800 LOX #SFSB Restore pointer
01130 5487 96 20 LOA A COUNT Sector count
01140 5489 D6 21 LOA B COUNT+1 LSB
01150 548B 26 01 BNE #+3 LSB Not B0? No borrow.
01160 548D 4A DEC A Borrow
01170 548E 5A DEC B Decrement
01180 548F 97 20 STA A COUNT

01190 5491 07 21 STA B COUNT+1
01200 5493 E8 03 ADD B 3,X Record number in header
01210 5495 A9 02 ADC A 2,X MSB
01220 5497 D8 0D ADD B STATUS Random file correction
01230 5499 09 00 ADC A #0
01240 549B 91 04 CMP A TEMD-1 Should add to total
01250 549D 26 04 BNE TRAEER LSB NG?
01260 549F D1 05 CMP B TEMD
01270 54A1 27 00 BEQ TRACE2 Looks good.

01290 54A3 B6 5205 TRACER LDA A DIRNUM Check entry number
01300 54A6 BA 5206 ORA A DIRNUM+1 LSB
01310 54A9 27 05 BEO TRACE2 B0? Free sector. Skip.
01320 54AB CE 56E2 LOX #RECET "Record # error at"
01330 54AE 20 39 BRA LOCERP

01350 54B0 96 0D TRACE2 LDA A STATUS Random file correction
01360 54B2 81 01 CMP A #1 1st directory sector?
01370 54B4 26 03 BNE #+5 0 or 2, ignore
01380 54B6 4C INC A Set for 2nd directory sector
01390 54B7 97 0D STA A STATUS Now 2 for rest of file
01400 54B9 B6 5207 LDA A DISKAD Track
01410 54BC F6 5208 LDA B DISKAD+1 Sector
01420 54BF 8D 03 BSR COMPAD Compute map address
01430 54C1 A6 00 LDA A 0,X Anything there?
01440 54C3 26 04 BNE CERR Collision!
01450 54C5 E6 01 LOA B 1,X
01460 54C7 27 06 BEO TRACE3 All's well
01470 54C9 CE 56CC CERR LOX #COLERT "Collision with #"
01480 54CC 7E 5437 JMP COLERR

01510 54CF B6 5205 TRACE3 LDA A DIRNUM
01520 54D2 F6 5206 LDA B DIRNUM+1
01530 54D5 A7 00 STA A 0,X
01540 54D7 E7 01 STA B 1,X This entry now on map
01550 54D9 CE A800 LOX #SFSB
01560 54DC EE 00 LOX 0,X Link to next
01570 54DE 27 13 BEQ LAST B0? Last record in chain
01580 54E0 96 20 LDA A COUNT Not last record.
01590 54E2 9A 21 ORA A COUNT+1 Remaining count
01600 54E4 26 06 BNE TRACE4 Not B0? Agrees.
01610 54E6 CE 56F5 LINKP LOX #LINKER Count 0, Link not 0.
01620 54E9 7E 5426 LOCERP JMP LOCERR
01630 54EC 8D 5410 TRACE4 JSR VALAD Check out link address
01640 54EF 24 08 BCC TRACE1 OK? Use link address
01650 54F1 20 F3 BRA LINKP Not OK. Link error.

01670 54F3 96 20 LAST LOA A COUNT Link says B0.
01680 54F5 9A 21 ORA A COUNT+1 So check sector count.
01690 54F7 26 0D BNE LINKP Link says B0, count not done.
01700 54F9 DE 06 LOX CATENT Link 0, Count 0.
01710 54FB EE 0F LOX $F,X Last sector per catalog
01720 54FD BC 5207 CPX DISKAD Agree?
01730 5500 27 03 BEQ LAST1 Same.
01740 5502 7E 542E JMP DIRERR Disagreement.
01750 5505 CE 5704 LAST1 LOX #OKTX "OK"
01760 5508 7E AEA9 JMP PSTRG1 Run text & RTS.

01780 *FREECK traces the chain of free sectors

01800 5508 4F FREECK CLR A
01810 550C B7 5205 STA A DIRNUM Directory entry # "0"
01820 550F B7 5206 STA A DIRNUM+1
01830 5512 CE 6E10 LOX #S6E10 System record start
01840 5515 DF 06 STX CATENT
01850 5517 CE 5709 LOX #FREET "Free sector chain"
01860 551A DD AD1E JSR PSTRMG
01870 551D 8D 5461 JSR TRACE Trace it out
01880 5520 CE 571C LOX #MAPT "Map test"
01890 5523 8D AEA9 JSR PSTRG1
01900 5526 B6 5209 LDA A ADRLIM Max 1&S or
01910 5529 F6 520A LDA B ADRLIM+1 1st W-D-R protected file
01920 552C 8D 5444 JSR COMPAD Find it in map
01930 552F DF 11 STX WHEMH Temporary reference
01940 5531 FF 5205 STX DIRNUM Reference for FIX0
01950 5534 4F CLR A
01960 5535 97 20 STA A COUNT
01970 5537 97 21 STA A COUNT+1 File sectors above limit
01980 5539 97 04 STA A TEMD-1
01990 553B 97 05 STA A TEMD Count of free sectors
02000 553C CE 5800 LOX #S5800
02010 5540 F6 6E27 FREE1 LDA B S6E27 Sectors per track
02020 5543 OF 22 STX SAYEX Working location
02030 5545 9C 11 FREE2 CPX WHEMH Limit for counting blanks
02040 5547 27 21 BEQ EXCT
02050 5549 A6 00 LDA A 0,X
02060 554B AA 01 ORA A 1,X Check for entry
02070 554D 26 00 BNE NOCT Entry, Don't count it.
02080 554F 7C 0005 INC TEMD Free sector.
02090 5552 26 03 BNE NOCT No carry.
02100 5554 7C 0004 INC TEMD-1 TEMD = 0? Carry to LSB
02110 5557 08 NOCT INX
02120 5558 08 INX
02130 5559 5A DEC B
02140 555A 2E E9 BGT FREE2 Sector count
02150 555C DE 22 LOX SAYEX Still on this track
End of track

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02160 555E C6 40	LDA B	#540	To start of next track	03150 5627 CE 0000	EXFIX	LDX	#0	Last link 0000
02170 5560 0D AD36	JSR	AD00X	XR = XR + 8	03160 562A 8D BE	BSR	SYPREP	#0	Set header
02180 5563 8C 6800	CPX	#5600	End of map area?	03170 562C FF 6E21	STX	\$6E21		Count, in Sys Record
02190 5566 26 08	BNE	FREEL		03180 562F FE 5207	LDX	DISKAD		
02200 5568 20 22	BRA	ENDCT	All done. Scram.	03190 5632 FF 6E1F	STX	\$6E1F		Ending sector
				03200 5635 CE A800	LDX	#5A800		
02220 556A A6 00	EXCT	LDA A	0.X	03210 5638 8D 5344	JSR	DWRITE		T & S still set
02230 556C AA 01	ORA A	1,X		03220 563B CE 0003	LDX	#3		Track 0 Sector 3
02240 556E 27 08	BEQ	MCT	Counting entries now	03230 563E 0F 00	STX	TRACK		For system record
02250 5570 7C 0021	INC	COUNT+1		03240 5640 CE 6E00	LDX	#56E00		
02260 5573 26 03	BNE	MCT		03250 5643 8D 5344	JSR	DWRITE		
02270 5575 7C 0020	INC	COUNT	MSB gets carry					
02280 5578 00	INX			03270 5646 CE 5760	EXIT	LDX	#00NET	"Done."
02290 5579 00	INX			03280 5649 8D E07E	JSR	PDATAT		Text to terminal only
02300 557A 8C 6800	CPX	#5600	End of map area?	03290 564C B6 0F	EX:TI	LOA A	#50F	Restore terminal page size
02310 557D 26 EB	BNE	EXCT	Keep counting	03300 564E B7 AC03	STA A	DEPTH		FLEX register
02320 557F CE 0020	LDX	#COUNT		03310 5651 7E AD03	JMP	WARMS		Back to FLEX
02330 5582 5F	CLR B							
02340 5583 8D AD39	JSR	OUTDEC	Display count	03330 5654 01	FCB	1,1,1,1		Elbow room
02350 5586 CE 5729	LDX	#LIMTX	"links above limit"					
02360 5589 8D AEA9	JSR	PSTRGI						
				03360		*TEXT FILE		
02380 558C DE 04	ENDCT	LDX	TEMD-1	03380 5659 10	TITLET	FCB	\$10,\$16,0,0,0,0	
02390 558E 8C 6E21	CPX	\$6E21	In system record	03390 565F 20	FCC	/	DISKFIX/	
02400 5591 27 06	BEQ	OK?	Print count.	03400 5660 04	FCB			
02410 5593 CE 5730	LDX	#CTERT	"Sector-count error: "	03410 566E 0D0A	DRVT	FDB	\$000A	
02420 5596 8D AD1E	JSR	PSTRNG	With CRLF	03420 5670 57	FCC	/	Which Drive? /	
02430 5599 CE 0004	LDX	#TEMD-1	Point to free-sector count	03430 567D 04	FCB	4		
02440 559C 5F	CLR B		No leading spaces	03440 567E 4E	#BOOTX	FCC	/No /	
02450 559D 8D AD39	JSR	OUTDEC	Print actual count	03450 5681 42	LOADTX	FCC	/Boot Loader/	
02460 55A0 20 02	BRA	FIXQ		03460 568C 04	FCB	4,4		
02470 55A2 01	FCB	1,1		03470 568E 20	NOTLT	FCC	/ not linked./	
02510			*FIXQ provides for consolidating the free chain	03480 569A 04	FCB	4		
02530 55A4 CE 5752	FIXQ	LDX	#FIXTX	03490 569B 20	LINKTX	FCC	/ linked to /	
02540 55A7 8D E07E	JSR	PDATAT		03500 56A6 04	FCB	4		
02550 55AA 8D AD18	JSR	INBUFF	Get operator response	03510 56A7 18	MARTX	FCB	\$10,9,\$C,\$10,\$39	Diablo margin set
02560 55AD FE AC14	LDX	LBUFF	Pointer	03520 56AC 04	FCB	4,4		
02570 55B0 A6 00	LDA A	0,X		03530 56AE 20	EPAREN	FCC	/ -- Deleted)/	
02580 55B2 04 5F	AND A	#5SF	Clear lower-case bit	03540 56BA 04	FCB	4		
02590 55B4 01 4E	CMF A	#N		03550 56BB 44	DIRECT	FCC	/Directory error./	
02600 55B6 27 2F	BEQ	EXITP		03560 56CB 04	FCB	4		
02610 55B8 01 59	CMF A	#Y		03570 56CC 43	COLERT	FCC	/Collision with #/	
02620 55BA 26 EB	BNE	FIXQ	Get a better answer	03580 56DC 04	FCB	4		
02630 55BC 7F 6E1E	CLR	\$6E1E	Starting sector	03590 56DD 20	ATTX	FCC	/ at /	
02640 55BF 4F	CLR A			03600 56E1 04	FCB	4		
02650 55C0 97 20	STA A	COUNT		03610 56E2 52	RECERT	FCC	/Record # error at /	
02660 55C2 97 21	STA A	COUNT+1	To provide record numbers	03620 56F4 04	FCB	4		
02670 55C4 06 01	LDA A	01	Starting track	03630 56F5 4C	LINKER	FCC	/Link error at /	
02680 55C6 07 5207	STA A	DISKAD		03640 5703 04	FCB	4		
02690 55C9 C6 01	LDA B	01	Sector	03650 5704 4F	OKTX	FCC	/O.K./	
02700 55CB F7 5200	STA B	DISKAD+1		03660 5708 04	FCB	4		
02710 55CE 8D 5444	JSR	COMPAD	Compute location in map	03670 5709 46	FREET	FCC	/Free sector chain /	
02720 55D0 A6 00	LDA A	0,X		03680 571B 04	FCB	4		
02730 55D3 AA 01	ORA A	1,X		03690 571C 0D0A	MAPT	FDB	\$000A	
02740 55D5 26 35	BNE	NEXE	This one's occupied.	03700 571E 40	FCC	4		
02750 55D7 7D 6E1E	TST	\$6E1E	1st entry?	03710 5720 04	FCB	4		
02760 55DA 26 1A	BNE	SAVE	No. Save old sector	03720 5729 20	LIMTX	FCC	/ links above limit./	
02770 55DC FE 5207	LDX	DISKAD	1st entry	03730 573C 04	FCB	4		
02780 55DF FF 6E10	STX	\$6E10	Starting Track & Sector	03740 573D 53	CTERT	FCC	/Sector count error: /	
02790 55E2 20 1D	BRA	GETN	Call down 1st sector	03750 5751 04	FCB	4		
02800 55E4 01	FCB	1,1,1	Breathing space	03760 5752 0D0A	FIXTX	FDB	\$000A	
				03770 5754 43	FCB	4		
02820 55E7 7E 564C	EXITP	JMP	EXITI	03780 576C 04	FCB	4		
			All done. Scram.	03790 576D 0D0A	DONET	FDB	\$000A	
02840 55EA FF A880	SYPREP	STX	\$A880	03800 576F 44	FCB	4		
02850 55ED DE 20	LDX	COUNT	Link bytes	03810 5774 04	FCB	4		
02860 55EF 00	INX							
02870 55F0 0F 20	STX	COUNT		03830 A04B	ORG	\$A04B		
02880 55F2 FF A882	STX	\$A8B2	Record number	03840 A04B 5200	FDB	DISKFX		Sets MIKBIK/DISKBIK entry
02890 55F5 39	RTS							
				03860		END		
02910 55F6 FE 5207	SAVE	LDX	DISKAD					
02920 55F9 8D EF	BSR	SYPREP	Next track & sector					
02930 55FB CE A880	LDX	#A880	Load header					
02940 55FE 8D 5344	JSR	DWRITE	Track & sector as before					
02960 5601 FE 5207	GETN	LDX	DISKAD					
02970 5604 0F 00	STX	TRACK	Will serve for WRITE later					
02980 5606 CE A880	LDX	#A880	Stay in buffer					
02990 5609 8D 5338	JSR	DREAD	Get sector					
03010 560C DE 22	NEXE	LDX	SAVEX					
03020 560E 00	INX		Working loc. in map					
03030 560F 00	INX							
03040 5610 8C 5205	CPX	DIRNUM	Map limit, from FREECK					
03050 5613 27 12	BEQ	EXFIX	Time to go?					
03060 5615 B6 5207	LDA A	DISKAD	This track					
03070 5618 F6 5208	LDA B	DISKAD+1	This sector					
03080 5618 5C	INC B		Next					
03090 561C F1 6E27	CMF B	\$6E27	\$0F or \$1E (Sys Record)					
03100 561F 23 AA	BLS	FIX4	Inner loop					
03110 5621 4C	INC A		End of track. Next...					
03120 5622 01 5209	CMF A	ADRLIM	Max track #					
03130 5625 23 9F	BLS	FIX2	Outer loop					

EXCT	556A	EXFIX	5627	EXIT	5646	EXIT1	564C
EXITP	55E7	EXRD	5177	EXSET	5021	EXW	50FB
FIX	5080	FIX2	55C6	FIX4	55CB	FIXQ	55A4
FIXTX	5752	FND	50C8	FREEL	5540	FREE2	5545
FRECK	5508	FREERR	520C	FREET	5709	FSB	A8B0
GETN	5601	HEXOS	530E	INBUFF	AD18	INCERR	50FE
INDEC	AD48	INEE	E1AC	LAST	54F3	LAST1	5505
LBIFP	AC14	LDBUF	502E	LDBUF1	502F	LINSET	53C8
LIMTX	5729	LINKER	56F5	LINKP	54E6	LINKTX	5698
LMSG	51EC	LOADTX	5601	LOCERP	54E9	LOCERR	542E
LTRM	AC11	MAP1	571C	MARTX	56A7	MEMSET	5012
MINIDP	5000	NBQOT	5208	NBQOTX	567E	MCT	5578
NEXD1	53EF	NEXD2	5407	NEQIR	53EC	NEXE	560C
NOCT	5557	MOSECT	000C	NOTLT	568E	OKTX	5704
OUTADR	AD45	OUTCH	AD0F	OUTDEC	AD39	OUTEP	5309
OUTHEX	AD3C	OUTL	000E	OUTR	0012	OUTS	5306
OUTS1	5307	PAUSE	AC09	PERLF	AD24	PDATA1	E07E
PGMERR	5208	PROGX	0018	PROGX2	001E	PSTRG1	AE49
PSTRNG	AD1E	PSTRP	5434	PUTCHR	AD18	RDYCK1	BF66
READ0	5003	READ1	5006	READP	0E00	RECERT	56E2
RESTD	505F	RSTOR1	0F39	RWORD	0010	SAVE	55F6
SAVES	0019	SAVEX	0022	SCOUNT	001D	SECERR	50FA
SECINC	50E4	SECINH	50E1	SECSET	50F4	SECTOR	0001
SECWRT	5022	SECWTD	5025	SECWT1	503E	SEEK	BEF6
SEET	5054	SETHEN	5020	SF50	A000	SP2	5317
SP4	5315	SP6	5313	STATUS	000D	SUM	5328
SVPREP	55EA	TEMO	0005	TITLET	5659	TRACE	5461
TRACE1	5479	TRACE2	5480	TRACE3	54CF	TRACE4	54EC
TRACER	54A3	TRACK	0000	TRANS	5153	TRANS1	515C
V	5002	VALAD	5410	VALERR	5424	VER	5202
VERIF1	5096	VERIF2	5098	VERIF3	509D	VERIFP	BE86
WAMP	500F	WAPMS	AD03	WERR	5052	WMEMH	0011
WEML	0012	WRET	5053	WRITE0	5009	WRITE1	500C
WRITEP	0E03	WSECT	0003	WTRACK	0002		

So the next time you order something tell them that you saw it in 68 MICRO JOURNAL. This helps us all. If they are not advertising in 68 MICRO JOURNAL (most do) tell them about YOUR magazine, it all helps to keep the wolf away.

Now for the bad part:  
EFFECTIVE FEBRUARY 1, 1981, the following are the new subscription rates for 68 MICRO JOURNAL.

1 YEAR	-	\$24.50
2 YEARS	-	\$42.50
3 YEARS	-	\$64.50

Now some GOOD NEWS: we will continue to accept subscriptions at the old rate, (see page 1) until that time, you can extend your current subscription up to 3 years additional, from your current expiration date, and save.

Again I want to express to each of you my regret that this increase has to be, but as you all are aware it seems to be a current trend that hurts us all.

DMW - - -

## SAD NOTICE!

Having held out longer than any other computer magazine (or practically any 'magazine', computer or not) it has become necessary to increase the subscription rate of 68 MICRO JOURNAL.

I believe that we have maintained our rate longer than any other computer magazine. I have done everything that could be done to hold this off, but the cost of paper has increased over 70% and the cost of postage nearly 100% since our last increase. Not to mention the cost of labor, other materials and office expenses. However, we have increased the size twice since the last increase and if the advertising holds up, we will increase the number of pages as we can in the future.

At the present time we could have approximately 5 to 6 more pages of advertising each month, BUT the product or dealer does not measure up, so we have refused the advertising, BECAUSE TOO MANY OF YOU HAVE TOLD ME THAT YOU 'NEED' TO HAVE FAITH IN THE ADVERTISING!! Our advertising policy is the most stringent in the entire industry. As a result you can feel fairly certain that items advertised in 68 MICRO JOURNAL function 'AS ADVERTISED'. As you know a couple of 'bad apples' have slipped in, but our record is far better than any of the other magazines that I know of, and I read them all. It all adds up this way: the more advertising the more pages in 68 MICRO JOURNAL and the less you have to pay for a subscription. In fact right now the subscriptions are not even paying the total postage bill. That's right, the other cost are covered by the advertising, book store and computer store sales of magazines. Bad products and dealers is not a solution, as we all pay far more in the long run.

## SINGLE CARD 6809

From 'down under' in Australia, a hotbed of 68XX activity, comes a new line of 6809 EXORciser™ boards, all useable with the FLEX™ disk operating system. Introduced earlier in Australia by PENNYWISE PERIPHERALS they appear to live up to this name 'pennywise', or a lot of computing power for so small a price. Especially if you compare them with other available cards for this system.

The first we have to review is the PMC-09 single card microcomputer. This card is a very complete and well done board. In fact, it is the MOST complete single board we have seen running the 6809! The board is solder masked and is the standard pin configuration for the popular EXORciser series from Motorola.

Due to the very extensive utility available I will only attempt to cover the more popular or necessary features that a card of this type would be expected to handle. After reading this I would suggest that you contact PENNYWISE direct for more detailed information.

The on-board EPROM Monitor for the system is named PSYCO. It has all the expected monitor functions and operates over the entire range of memory maps in addition to each individual memory map. User memory map tables may be altered from the keyboard or software, but the PSYCO memory map is in PROM and therefore unalterable. To alter, examine or otherwise execute a PSYCO function on any map the function call is preceded by the number of the particular map. In addition to baud rate selection via



the monitor for the serial interface the monitor also allows parity and other information to be channeled to the interface, preventing conflicts between the terminal status and the serial device status.

As in many other monitor systems there is difficulty in determining the physical from the logical memory assignment. PSYCO allows examination of both by page, both those whose map has been listed and pages that have not been assigned. In addition most all memory functions are allowed by physical or logical position.

Included with the extensive instruction manual for the PSYCO monitor is a ADVANCED PROGRAMMING GUIDE for using the system in single and multi-user disk systems. With the large degree of utilization available, this section details the memory mapping and addressing details necessary to efficiently program for the onboard memory management hardware.

PSYCO maintains 10 Map Tables. These numbered 0-9 are designated as '0' used only by PSYCO, '1' additional SYSTEM map and eight user maps. All maps have their own hardware stack which allows multi-user operation.

The Pennywise PMC-09 has the following major features:

Memory mapping hardware with expanded addressing. The memory mapping and protection hardware are VIRTUAL MEMORY examples found usually only on large systems. Physical addresses reside within 256K, of this 64K is reserved for on-board devices and the remaining 192K available off-board.

Each 4K can be write protected or designated absent. Because of its multi-user capability it controls both SYSTEM and USER memory map and protection. Each type of interrupt can be set to return to the system or remain in the memory map in which it occurred.

Also included is an RS-232C serial interface with software controlled baud rates. In addition to the RS-232C serial interface built on the board there is also a PIA with dual timers. Four EPROM sockets are available (2716-2732), three of which are used by PSYCO and one for user utilization, and 1K RAM mostly used by PSYCO. DMA and dynamic memory refresh steal logic and slow memory compatible. All data, address and control lines are buffered with three-state components.

The documentation is excellent and complete with drawings and very clear instructions. Each line is defined and explained and it should be little problem for the average user to expand an older D1-D2 or EXORciser™ from a 6800 to 6809 system.

Speaking of the documentation would not be complete without a look at the instructions included for using this system and their FLOPPY DISK controller (which also has an RS-232C interface) with FLEX™.

The PENNYWISE PERIPHERALS FDCP-58 is a multi disk controller and handles a mix of '68' Micro Journal

5 and 8 inch disks, single density. PSYCO contains a 'boot' for FLEX™ however, it is required that a different set of terminal and disk drivers as well as a mixed size (5-8) newdisk be used. These are supplied on a disk with the controller board. It is to be noted that PENNYWISE plainly states that FLEX™ is a copyright (internationally) product and that FLEX™ itself should be PURCHASED through a TSC dealer or TSC direct. Those who do not mix disk sizes will only have to use the supplied terminal drivers as the disk drivers and NEWDISK are the same.

In addition to the above mentioned products from PENNYWISE they also offer 16K static RAM cards, 16K CMOS RAM cards with battery backup, 16K PROM and programmer card, 16/32/64 PROM/ROM cards with bank select 4K or 8K banks selected by software and a wire wrap card with full ground plane and plated feed through holes.

Additional information may be had by contacting:

PENNYWISE PERIPHERALS, PO BOX 398, Camberwell, Victoria, Australia, 3123.

## RLOAD 3.0

by HL Harkness  
Word's Worth  
Box 28954  
Dallas, Texas 75228

Since the publication of RLOAD, I have made several major modifications, which I will describe herein. I don't plan any more work on RLOAD, even though there are a lot of things that could be done, mainly because I have finally got it into a form that satisfies me.

Unfortunately, I ended up changing nearly every module in RLOAD, so the business of publishing the changes is already out of hand. Nor is it really worthwhile to mail hardcopy of the listings, since they cost more to produce (and take longer) than the more useful disk copy. So I am no longer offering hardcopy. The economics of the situation would certainly be different if more people were interested in RLOAD.

I am getting an average of three orders a week. I didn't really expect much more. I originally projected that the total demand for RLOAD would be 20. Dave Wilson, at the Micro Store here in town, told me to expect 60-70. Turned out my guess was closer. The reason? Those of you who have never used a relocating linking assembler - loader system probably don't realize what you are missing, and those of you who have, probably had better sense than to allow yourselves to get stuck with an absolute assembler. (That's my guess, anyway)

The following changes have been made to RLOAD:

(1) The ENTER routine had a problem in that it did a signed compare to find

if the symbol table extended to the end of available memory. Much to my great embarrassment, when I recently installed more memory in my own system, the loader no longer worked at all. The signed compare was changed to an unsigned compare.

(2) The load map was not as useful as it might have been. In addition to sorting the symbol table, I arranged it to print 5 symbols per line. Then I decided that it would be nice to have external references reported, in order to make it easier to write a cross-reference generator later. Then it occurred to me that the only use I normally have for a cross-reference is to find which module is trying to load an undefined external. As an afterthought, I made PASS2 report each occurrence of an undefined external along with the name of the file requesting it.

(3) I got somewhat weary of the name COREFILE.COM, so I created a loader directive called :NAME, which can be used to give the output file any name desired. The syntax is :NAME <name>. Once I had the code necessary for handling directives, I put in the :CODE and :DATA directives, to be used with the CSCT and DSCT pseudo-ops. These directives allow the user to direct the loading of ROM and RAM in different places.

(4) The original RLOAD didn't just default to loading module files with the .BIN extension, it required it. This wasn't exactly what I had in mind, so I fixed it. While I was at it, I arranged for files to be loaded from the 'working' drive, not just drive 1.

(5) One aspect of RLOAD that really bothered me was the fact that referencing external subroutines involved an indirect PC-relative addressing mode. A friend of mine, Bill Knight, came up with the solution which he kindly explained to me at the 68xx user's group meeting. This is definitely one I wish I'd thought of myself! All I had to do was write a new EXT macro which stuck a JMP instruction before the address field, and I had a jump-table entry instead of just a link. Now, the only thing required to access an external subroutine is a BSR <external>. The logical extension of this is the CALL macro, which does the same thing inline, only with a JSR instruction. The real beauty of the thing is that no changes are required to RLOAD at all! Note: external data must still be accessed the old way. I added another macro, EXTDAT, which is identical to the old EXT, for external data.

At this point, RLOAD is beginning to evolve into something else entirely. Bill Knight and another friend, Allan Battieger, have been working for some time on a C compiler. Allan got most of the Small-C (published by Ron Cain in DR. DOBB'S) working under DOS69D (Smoke Signal Broadcasting's OS for the '09),

producing relocatable code for Smoke's loader. When he adapted it for FLEX (TSC), he didn't have a similar loader, so he made it an absolute version. Bill then took the thing and expanded it, and I furnished him with a copy of the pre-release version of RLOAD. He then managed to work out a way to use RLOAD with the compiler, but requested a very special version of it. The new loader, tailored specifically for this C compiler, is called CLINK. I probably won't be releasing the source code to CLINK, mainly because the binary will be included with C, and it isn't much good for anything else.

Allan has asked me to distribute his C compiler, so I will be taking out some ads as soon as we work out an agreement on methods, prices, etc., and version 1.0 is ready to ship. Our current plans are to produce a full C in (at least) three steps; version 1.0, to be available in the very near future, version 2.0 in 6-8 months, and version 3.0 in a year or so. I have noted that there is already another C out, and I would definitely be interested in a comparison review of both his and ours. I will be shipping a review disk to '68 as soon as it is available.

Meanwhile, RLOAD is still available, but effective the first of December, the price will be \$17.50, the same as the service charge of '68 for their library service. As a matter of fact, I will be donating RLOAD to the '68 library (provided they even want it), and will probably stop distributing it myself after four or five months. The '68 library is close to what I had in mind when I referred to a user's library in my article, although I'm not certain that they really want to pursue the idea to its logical extreme. If not, I may very well attempt to organize such a service. A large enough volume might even allow me to go back to \$15/disk!

Which brings up another problem... namely, I'm not sure what I'd be getting into. Two or three orders a week is not much of a burden, but doesn't really get very exciting, either. On the other hand, 75 orders a week might be a drag of the first order, especially after I tire of spending all of my free (?) time duplicating and verifying disks. The only solution to the latter that I know of is to raise prices to the point that the demand goes down to an acceptable level. That goes against the grain, and doesn't fit the concept of a user library very well. If somebody else out there wants to try this sort of thing, or has some suggestions on how it should be handled, I certainly would like to hear from you.

## SUPPORT YOUR ADVERTISERS

# CHESS

November 8, 1981  
Rt. 1 Box 1354  
Del Valle, TX 78617

Dear Don,

It is my pleasure to make this the first public announcement of a new and powerful chess program specifically designed to utilize the advanced features of the Motorola MC6809 and MC68000 microprocessors. Even though the program has just been running a couple of weeks it has shown amazing strength. I apologize for not having it completed when expected but as you may remember I lost my home in a flood earlier this year.

The chess program, christened Rapier, makes use of the flexible Motorola addressing modes and index register capabilities. By designing algorithms which specifically take advantage of the MC6809 instruction architecture I have generated a program which appears at this time to be a complete leap ahead of any other microprocessor chess program. Rapier averages an amazing 280 moves per second with complete board analysis for each move. This analysis consists of pawn structure, king protection, castling ability, dynamic attacks, and piece mobility among other things. As an example, the highly rated chess program Boris/Sargon 2.5 Modular Game System advertises mate-in-two problem solving times of about two minutes and costs \$300 a unit. Rapier does mate-in-two problems in an average of 14 SECONDS!!

I have played Rapier against Chess Challenger-7 by Fidelity Electronics (\$115 in stores around here) and the Atari TV video game chess cartridge (\$40.) It beats both easily even when limited to half the move time for evaluation. I have included a typical game description with full statistics for those who are interested in examining Rapier's playing ability. I have not yet played Rapier against any other chess games but have found a variety of mate-in-two problems solved by various chess computers and microprocessors. It is interesting to note that against the Boris/Sargon unit Rapier in every case solved each problem at least twice as fast. In fact, one mate-in-three problem took Rapier 25 seconds and the Boris/Sargon unit 8 minutes and 24 seconds.

Below is a chart showing mate problem solving performed by Chess Challenger-7, Boris/Sargon 2.5, and Rapier. The first three problems are from Reinfield's 1001 Brilliant Ways to Checkmate (1979 Edition, Published by Wilshire Book Company) and were timed by Dr. W. W. Foster for an article in October 1980 Personal Computing titled 'Six Test Problems for Chess-Playing Machines'. The next three problems are from 'A Guide To Home Chess Computers' published by Palmer McBride & Kincaid Associates manufacturers of the Boris/Sargon 2.5 Modular Game System. Rapier was running with a 2 Megahertz MC6809 on a Motorola EXORcisor system (Motorola development system) hooked to a SWTPC CT-82 terminal. No timings for CC-7 '88' Micro Journal.

are available for the last two entries.

By the way, I expect the MC68000 version to average one second for mate-in-two problem solving. If the MC6809 version of Rapier doesn't take the world championship title, the MC68000 version currently in the works certainly should.

I have included a complete game of Rapier playing against Chess Challenger-7 and the beginning of a short game with the Atari home video system. It is interesting to note that in the Challenger game Rapier early on predicts a one pawn advantage and then proceeds to prove itself correct by capturing a pawn BEFORE CHESS CHALLENGER IS OUT OF OPENING BOOK!! Remember, Rapier does not think on opponents time and was restricted to much less time than the Challenger on a per-move basis. For those wishing to follow the game notation the squares on the chess board are assigned column positions A through H and row positions numbered 1 through 8. The grid is based on the white player's point of view. Several statistics of interest are given including:

- 1) a plus mark '+' for check called.
- 2) an small letter 'b' representing a book move by that side
- 3) an asterisk meaning that Rapier predicted the move
- 4) the time in seconds for each side's move (the current version of Rapier does not think on opponent's time and a recent change has speeded up searching by 10%)
- 5) Rapier's analysis of material advantage in pawns at that point in the game
- 6) Rapier's attack evaluation count for each move (an attack being a non-trivial evaluation where a square has at least one enemy attacker and one friendly defender)
- 7) Rapier's positions-per-second evaluation average for each move

This is the first version of Rapier and the playing options available are quite sufficient. Any time the player is prompted for a move there are several commands available. For example, the board may be altered or the ply search depth level changed. There are chess procedures that Rapier handles properly, yet seem to give other chess programs fits. For example, I understand Boris/Sargon 2.5 does not handle the simple case of draw by repetition. It will avoid them at all costs even to the point of losing a won game. And, my Chess Challenger often does not even allow legal moves, such as when a king moves onto a square normally attacked by an enemy piece that is currently pinned against its king. Rapier even calls its own draw by repetition when appropriate, a feature I have not heard offered by any other microprocessor chess program.

There is already a Rapier II on the drawing boards. It will support a wide range of options such as move-takebacks, automatic mate problem solving (you set the board up - it tells you the quickest mate possible) and a host of other goodies. And with the full facilities of a home computer it can support functions unavailable to the store-bought games such as a huge library of opening book moves or game archiving and checkpointing on disk. The opening book additions, for example, will allow you to insert your own book openings. This version will probably follow the initial one by a year and be an even sharper competitor.

There is also a MC68000 version of Rapiet being prepared. I expect it to examine close to 1,500 board positions per second and, hopefully, share the world microprocessor chess champ title with it's MC6809 brother.

It may be of interest to your readers to know that I am a horrible chess player. Rapiet beats me at three seconds per move (it gets three seconds, I get as long as I want.) This makes for an unusual combination of poor chess player writing an excellent chess program. In fact, I had to go out and buy a book halfway through the program coding to find out what an en passant capture was and what a draw-by-repetition entails. It should be very interesting to see what this program does in computer chess tournaments.

The MC6809 Rapiet I version has been completed. All that remains to be done is to create a user's manual and move the program over to a Flex system. I will keep you in touch with the final stages as they occur.

Sincerely,  
Bud Pass

# RAPIET I VERSUS CHSSE CHALLENGER 7 OCTOBER 10, 1981

White - Chess Challenger 7  
90 Seconds per move  
(Level 3)

Black - Rapiet I  
20 Seconds per move  
(Level 3)

Move	From-To	Secs	From-To	Secs	Material	Positions	Pos/sec
1	E2-E4 b	0	E7-E5 b	0	+0	3472	248
2	G1-F3 b	0	B8-C6	14	+0	5400	270
3	F1-C4 b *	0	F8-C5	20	+0	6400	256
4	C2-C3 b	0	G8-F6	25	+0	7511	259
5	D2-D4 b *	0	E5-D4 X P	29	+0	5020	251
6	C3-D4 X P b	0	C5-B4 *	20	+1	5800	212
7	C1-D2 *	70	F6-E4 X P	25	+1	11,895	195
8	D1-B1	114	B4-D2 X B	61	+1	17,751	239
9	B1-D2 X B *	56	E4-D6	61	+1	6,111	291
10	E1-G1	83	E8-G8	21	+1	22,650	302
11	A2-E1	70	D6-C4 X B	75	+1	7,728	322
12	B3-C4 X N *	86	D7-D5	24	+1	14,444	314
13	C4-B5	69	A7-A5	46	+1	20,460	310
14	E1-E3	91	D8-D6	68	+1	27,548	284
15	F1-E1	89	C6-B4	97	+1	14,575	265
16	E3-A3 ?	119	B4-C2	55	+2	12,480	260
17	A3-A5 X P *	136	A8-A5 X R	48	+2	12,105	269
18	B5-A5 X R *	104	C2-E1 X R	45	+2	6,984	291
19	P3-E1 X N *	66	B7-B6	24	+2	6,792	283
20	A5-C3 *	40	C7-C5	24	+2	4,986	277
21	D4-C5 X P *	61	B6-C5 X P	21	+2	6,663	266
22	E1-D3	57	C5-C4	25	+2	18,852	316
23	D3-E5	60	F7-F6	47	+2	5,040	280
24	E5-F3 *	62	Q7-Q5	18	+2	5,073	267
25	C3-D4	64	G5-G4	19	+2	9,415	269
26	F3-H4	71	D6-E5	35	+2	1,368	342
27	D4-E5 X Q *	55	F6-E5 X Q	4	+2	3,087	343
28	A2-A4 *	20	C8-D7	9	+3	3,024	336
29	A4-A5	32	F8-B8	9	+3	1,998	333
30	D2-F1	26	B8-B2 X P	6	+3	2,191	313
31	A5-A6 *	19	B2-A2	7	+4	2,177	242
32	F2-F1	26	C4-C3	9	+4	1,883	269
33	F3-G4 X P *	31	C3-C2	7	+9	1,202	240
34	H4-F3	20	C2-C1 (O)	5	+9	2,788	164
35	P3-E5 X P	33	D7-B5	17	+14	2,516	148
36	E5-D3	35	B5-D3	17	+14		
37	H2-H3	15	C1-F1 X N	0	"MATE IN ONE"		
38	G1-B2 "I LOSE" ?	3	P1-G2	0	"CHECKMATE"		

Here is a sample from a game against the Atari video game system. The times per move are about the same as the previous game. Notice the sacrifice by Rapiet at move 7, and how quickly it takes strategic control of game.

White - Rapiet Black - Atari home video system

Move	From-To	Material	From-To
1	D7-D5 b	+0	D2-D4
2	C8-F5	+0	G1-F3
3	E8-A4	+0	B1-A3 *
4	E7-E6	+0	C1-G5 *
5	F7-F6	+1	G2-G4
6	F-A3 X N	+2	B2-B3 *
7	F5-C2 X P *	+3	D1-E2 X B *
8	A4-C6 *	+3	E1-C3 *
9	C6-C3 X O *	+3	C2-C3 X O *
10	F6-G5 X B	+3	F3-G5 X P *
11	D8-E7	+3	G5-F3
12	G8-F6	+4	F3-E5

Problem	Chess Challenger-7	Boris/Sargon MGS	Rapiet I
Reinfeld's Problem 2	14 minutes	50 seconds	13 secs
Reinfeld's Problem 3	3 minutes	25 seconds	7 secs
Reinfeld's Problem 4	33 hours	8 min 24 secs	25 secs
Guide Figure 1	Unable to solve	3 min 10 secs	62 secs
Guide Figure V	-	55 secs	10 secs
Guide Figure V1	-	22 secs	10 secs

From page no. 11

GIVEN: ANGLE A

$$\text{LET } X = \sin(A)$$

$$\text{BY DEFINITION } A = \arcsin(X)$$

$$\sin^2(A) + \cos^2(A) = 1$$

$$\cos^2(A) = 1 - \sin^2(A)$$

$$\cos(A) = \sqrt{1 - \sin^2(A)}$$

$$\sin(A) = X$$

$$\frac{\sin(A)}{\cos(A)} = \tan(A) = \frac{X}{\sqrt{1-X^2}}$$

$$A = \arctan\left(\frac{X}{\sqrt{1-X^2}}\right) \text{ BEST SOLUTION}$$

$$\text{SINCE } X = \sqrt{x^2}, \quad \frac{X}{\sqrt{1-X^2}} = \frac{\sqrt{x^2}}{\sqrt{1-x^2}} = \sqrt{\frac{x^2}{1-x^2}}$$

THAT IS MY BAD SOLUTION

DIVIDING THE NUMERATOR AND DENOMINATOR BY  $x^2$  YIELDS

$$\sqrt{\frac{1}{\frac{x^2}{1-x^2}}}$$

WHICH IS BOB REIMILLER'S ORIGINAL TRY.

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I have been using the TEST program from the TSC 6889 FLEX Diagnostic set for some time. However, I found that it did not function properly with double-density 5" floppy drives. I wrote the TESTDISK program, listed below, to replace it and to work properly with double-density and double-track 5" floppy drives. TESTDISK also speeds the testing process significantly for 8" floppy drives and 5" single-density floppy drives by using the correct interlace table. Apparently, the TSC version of the NEWDISK program contains a different interlace table from the SWTPC version. TESTDISK displays the current track number continuously and may be stopped by hitting the "escape character" defined by TTYSET.

The double-density 5" floppy disk controller in my system works very well. It is the BDC-16 board sold by Southeastern Micro Systems, of Conyers, GA. It is available in bare-board and assembled-and-tested forms. It offers optional on-board write pre-compensation and standard additional digital filtering of raw read signal, plus eleven shorting pins, to enable it to be used with most 5" floppy drives. It will work with Siemens, Wangco, and Shugart in double-density mode, which is not possible with some other SS-30 double-density disk controller boards.

Sincerely,  
Bud Pass  
Bud Pass



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C100      ** TEST/DISK          PAG
          ORG          PC100
C100 30 05  ** STARTER BRA START1
C102 01 2E 00 3A  ** VERBISN PCB $B2,$2E,$80,$3A,$80 VERSION 1.0:0
          ** INITIALIZATION
          **
C107 4F  ** START1 CLRA          RESERVE STACK SPACE
C108 5F  **          CLRB
C109 34 06  **          PSHS A,B
C108 34 06  **          PSHS A,B
C100 34 06  **          PSHS A,B
C107 33 24  **          LEAU ,B          POINT U-REG TO STACK
          **
          ** TEST TRK DISK
          **
C111 8D 13  ** TESTSK BSR GETDRV          GET DRIVE AND SIR
C113 8D C 24  **          JSR PRCLRP          DO CLRP
C116 17 01E2  **          LBSR CHKDSK          CHECK ALL TRACK/SECTORS
C119 8D C024  ** FINISH JSR PRCLRP          DO CLRP
C11C 30 8D 033E  **          LEAX OF1816,PCB "TEST COMPLETED"
C120 8D C01E  ** P1W161 JSR P1W161
C123 7E C003  **          JMP WARMST          EXIT TO PLEX
          **
          ** GET DRIVE NUMBER
          **
C126 8D C042  ** GETDRV JSR GETHEX          SCALE ON PARAMETER ON LINE
C129 23 0E  **          BCS GETDAB
C120 5D  **          TSTB
C12C 27 11  **          BEQ GETDRD
C12E 1F 10  **          TFR X,D
C130 C4 03  **          ANDB #03          MASK DRIVE NUMBER
C132 8E C040  **          LDX $SYSFCH          FILL IN PCB
C135 27 03  **          STB $03,X          DRIVE NUMBER
C137 20 23  **          BRA ANLSIR
C139 30 8D 0402  ** GETDRB LEAX Q1140H,PCB "ILLEGAL DRIVE NUMBER"
C130 20 E1  **          BPL FINISI
C137 76 C00C  ** GETDRD LDB WAKDRV          TRY TO USE DEFAULT WORK DRIVE
C142 2A E5  **          BSR GETDRP
C144 30 8D 040E  **          LEAX Q000RV,PCB "DRIVE MUST BE SPECIFIED"
C140 20 D6  **          BRA FINISI
          **
          ** LOOK FOR TRACK/SECTOR IN TABLE
          **
C14A 1B 8D 022C  ** FINBIR LEAX TRKSEC,PCB
C14E 10A3 01  **          HPO X,X
C151 27 0B  **          BEO FINISX
C153 30 02  **          LEAX $02,X
C155 6D 04  **          TBY ,X
C157 26 F5  **          BNE FINISN
C159 1C F8  **          ANDCC $5F8
C150 30  **          FINISX RTS
          **
          **
C15C 17 0194  ** ANLSIR LBSR DPHBIR          GET SIR
C15F 26 5B  **          BNE BADSIR
C161 EC 8B 1A  **          LDD $1A,X          GET MAX TRACK AND SECTOR
C164 2D C9 0080  **          STD TRACKS,U          SAVE MAX TRA K AND SECTOR
C166 C7 C9 0082  **          STB SECTNO,U          SAVE MAX SECTORS US TRACK U
C16C 17 F0D0  **          FIM 1R          LOOK UP ON TABLE
C16F 26 2E  **          BNE MOTWSC
C171 EC 04  **          LDD ,X          GET INTERLACE OFFSET
C173 11 8C 0A  **          LEAY STARTR,PCB
C176 31 AB  **          LEAY D,Y          COMPUTE INTERLACE TABLE ADDRESS
C178 E6 A4  **          LDB ,Y
C17A 27 C9 0082  **          STB SECTRO,U          MAX SECTORS ON TRACK U
C17E 31 21  **          LEAY $01,Y
C180 10A7 C9 0083  **          STY INTRLC,U          SAVE INTERLACE ADDRESS
          **
          ** PRINT MAX TRACK AND SECTOR
          **
C185 30 8D 03AD  ** PRMT1 LEAX Q0A7E,PCB "MAX TRACK/SECTOR"
C189 8D C01E  **          JSR PSTRNG
C18C 30 C9 0000  **          LEAX TRACKS,U
C190 8D C03C  **          JSR OUTHEX
C193 86 2F  **          LDA $52F
C195 8D C01B  **          JSR PUTCHB
C198 30 C9 0001  **          LEAX SECTRS,U
C19C 7E C03C  **          JMP OUTHEX
          **
          ** TRACK/SECTOR NOT IN TABLE
          **
C19F 30 8D 02D5  ** NOTKSC LEAX Q031R,PCB "BAD SIR"
C1A3 8D C01E  **          JSR PSTRNG
C1A6 8D 0D  **          BSR PRMT1S          "MAX TRACK/SECTOR"
C1A8 30 8D 03AB  **          LEAX QAC0T,PCB "ACCEPTABLE?"
C1AC CC 594E  **          LOD $594E
C1AF 17 011C  **          LBSR OUTGET
C1B2 26 0F  **          BNE CONSIG
C1B4 30 8D 030B  **          LEAX Q0A0G,PCB "WARNING"
C1B8 8D C01E  **          JSR PSTRNG
C1B0 39  **          NOTKX RTS
          **
          ** BAD SIR (COULD NOT READ)
          **
C1BC 30 8D 02B0  ** BADSIR LEAX Q031R,PCB "A BAD SIR"
C1 0 8D C01E  **          JSR PSTRNG
          **
          ** GET SIR FROM CONSOLE
          **
C1C3 CC FFFF  ** CONBIR LDD $FFFF          GET SIR FROM CONSOLE
C1C6 ED C9 0000  **          STD TRACKS,U
C1CA E7 C9 0002  **          GTO SECTRO,U
C1CE 30 8D 03CA  **          LEAX Q0A0PL,PCB "HARD OR FLOPPY"
C1D2 CC 4046  **          LDD $4046
C1D5 17 00F6  **          LBSR OUTGET
C1D8 27 7A  **          BBO C0041V
C1DA 30 8D 020A  **          LEAX Q01E50,PCB "DISKETTE SIZE"
C1DE CC 3538  **          LDD $3538
C1E1 17 00EA  **          LBSR OUTGET
C1E4 27 1F  **          BEO CONBIS
          **
          ** 0" DISKETTES
          **
C1EA CC 4C0F  ** CONSI0 LDD $4C0F          8" IF HERE
C1ED ED C9 0000  **          STD TRACKS,U          77 TRACKS, 15 SECTORS
C1E8 E7 C9 0002  **          GTO SECTRO,U
C1F1 20 8D 02DC  **          LEAX Q000EV,PCB "SINGLE/DOUBLE DENSITY"
C1F5 CC 5344  **          LOD $5344
C1F8 17 00D3  **          LBSR OUTGET
C1FB 27 47  **          BEO CONSD0
C1FD C6 1A  **          LDB $1A
C1FF E7 C9 0 1  **          STB SECTRS,U          26 SECTORS
C203 20 3F  **          BRA CONSD0
          **
          ** 5" DISKETTES
          **
C205 CC 270A  ** COMS15 LDD $270A          5" IF HERE
C208 ED C9 0000  **          STD TRACKS,U          35 TRACKS, 10 SECTORS
C20C E7 C9 0002  **          STB SECTRO,U
C210 30 8D 0101  **          LEAX Q0A3J4,PCB "35/48 TRACKS"
C214 CC 3334  **          LOD $3334
C217 17 0004  **          LBSR OUTGET
C21A 20 06  **          BBO COMS14

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C21C 86 22  **          LDA $522
C21E A7 C9 0000  **          STA TRACKS,U          35 TRACKS
C222 30 8D 02CE  ** CONB14 LEAX Q007R,PCB "SINGLE/DOUBLE TRACK"
C226 CC 5344  **          LOD $5344
C229 17 00A2  **          LBSR OUTGET
C23C 27 86  **          BEO CONB14
C23E 6A C9 0000  **          ASL TRACKS,U          DOUBLE TRACKS
C232 30 8D 0290  ** CONBTK LEAX Q000EN,PCB "SINGLE/DOUBLE DENSITY"
C236 CC 5344  **          LOD $5344
C239 17 0092  **          LBSR OUTGET
C23C 27 06  **          BEO CONSD0
C23K C6 12  **          LDB $12
C240 27 C9 0001  **          STA SECTRS,U          10 SECTORS
          **
          ** 5" AND 0" DISKETTES
          **
C244 30 8D 026B  ** CONBDB LEAX Q0D 1D,PCB "SINGLE/DOUBLE SIDED"
C248 CC 5344  **          LOD $5344
C24B 17 0068  **          LBSR OUTGET
C24E 27 04  **          BEO CORB1X
C250 68 C 0001  **          ASL SBCTRS,U          DOUBLE SECTORS
C254 39  **          CONB1X RTS
          **
          ** PRINT STRING POINTED TO BY X-REG
          **
C255 A6 8B  **          F TSTR LDA ,X+
C257 08 84  **          CRPA $304
C259 27 05  **          BBO PATSTX
C25B 8D C01B  **          JSR PUTCHB
C25E 20 F5  **          BRA PRTSYB
C260 39  **          PATSTX RTS
          **
          ** PRINT TRACK NUMBER AND CHECK FOR INPUT
          **
C261 34 76  ** PBTTRK PS 5          U,Y,X,B,A
C263 30 8B 1E  **          LEAX $1E,X          TRACK AND SECTOR
C266 8D C03C  **          JSR OUTHEX          PRINT TRACK
C269 86 0D  **          LDA $80D
C26B 8D C016  **          JSR PUTCHB          SEND CR
C26E 8D C04E  **          JSR STATUS          Z CLEARED IF INPUT
C271 1026 FEA4  **          LBSR FINISH
C275 35 F6  **          PULS PC,U,Y,X,B,A
          **
          ** READ A SECTOR
          **
C277 34 14  ** GETSEC PSNS B,X
C279 86 09  **          LDA $589          READ SINGLE SECTOR
C27B A7 84  **          STA ,X
C27D 8D 0466  **          JSR CALFMS          CALL FMS
C280 27 29  **          BEO GETSEK
C282 A6 01  **          LDA $01,X
C284 30 8D 037C  **          LEAX Q0E0NF,PCB "SECTOR NOT FOUND"
C288 85 10  **          BITA $10
C28A 26 0D  **          BBO GETSER
C28C 85 0B  **          BITA $50B
C28E 26 11  **          BNE GETSEK
C290 30 8D 035C  **          LEAX Q0RVNR,PCB "DRIVE NOT READY"
C294 8D 18  **          BSR PRTRAD
C296 17 FE00  **          LBSR FINISH          EXIT TO PLEX
C299 8D C9 00  **          BSR PRTRAD          SECTOR NOT FOUND
C29B 1C F8  **          ANDCC $5F8
C29D 3A 01  **          ORCC $501
C29F 35 94  **          PULS PC,X,B
C2A1 30 8D 0374  ** GETSEP LEAX Q0RCER,PCB "CRC ERROR"
C2A5 8D 07  **          BSR PRTRAD
C2A7 1C F4  **          ANDCC $5F4
C2A9 35 94  **          PULS PC,X,B
C2AB 4F  **          GETSEX CLRA
C2AC 35 94  **          PULS PC,X,B          NORMAL EXIT
          **
          ** PRINT DISK ADDRESS AND ERROR MESSAGE
          **
C2AE 34 10  ** PRTRAD PSNS X
C2B0 30 8D 0373  **          LEAX Q0A0RS,PCB "ADDRESS:"
C2B4 8D C01E  **          JSR PSTRNG
C2B7 8E C05E  **          LDX $5V5PCB+$1E POINT TO TRACK AND SECTOR
C2BA 8D C045  **          JSR OUTDAB          DISK ADDRESS
C2BD AE F4  **          L X
C2BF 17 FF93  **          LBSR PRSTTR          RESTORE POINTER
C2C2 8D C024  **          JSR PRCLRP          DO CLRP
C2C5 8D C04E  **          JSR STATUS          Z CLEARED IF INPUT
C2C8 1B26 FE4D  **          LBSR FINISH
C2CC 35 90  **          PULS PC,X
          **
          ** OUTPUT STRING AND GET RESPONSE
          **
C2CE 34 16  ** OUTGET PSNS X,B,A
C2D0 AE 62  ** OUTGTA LDX $02,S
C2D2 8D C01E  **          JSR PSTRNG
C2D5 8D C015  **          JSR GETCHB
C2D8 84 7F  **          ANDA $57F          MASK PARITY
C2DA 81 03  **          CMFA $503          CHECK FOR CTRL-C
C2DC 1B27 FE39  **          LBSQ FINISH
C2DE 81 5F  **          CMFA $55F
C2E2 22 02  **          BHI OUTGEU
C2E4 84 5F  **          ANDA $55F          CHANGE TO UPPER CASE
C2E6 A1 E4  **          CMFA ,B
C2E8 27 04  **          OUTGEU CMFA $0B
C2EA A1 61  **          CMFA $01,S
C2EC 26 E2  **          BNE OUTGTA
C2EE A1 E4  **          OUTGEU CMFA ,S
C2F0 32 64  **          LEAS $04,S
C2F2 39  **          RTS
          **
          ** OPEN SIR AND READ INFO RECORD
          **
C2F3 86 10  ** OPMS1X LDA $10          OPEN SIR
C2F5 8E C040  **          LDX $5V5PCB
C2F8 A7 04  **          STA ,X
C2FA 8D D486  **          JSR CALFMS          CALL FMS
C2FB 86 07  **          LDA $507
C2FF 0 1 C040  **          LDX $5V5PCB
C302 A7 84  **          STA ,X
C304 7E D486  **          JMP CALFMS          CALL FMS
          **
          ** FIND INTERLACE AND READ DISK
          **
C307 CC 0001  ** CHMSK LOD $0001          START WITH TRACK 00 SECTOR 01
C30A 8E C040  **          LDX $5V5PCB          POINT TO PCB
C30D 10AE C9 0003  **          LDT INTRLC,U          INTERLACE ADDRESS
C310 27 0E  **          BBO REDGED
          **
          ** READ WITH INTERLACE
          **
C314 17 003A  ** REDINT LBSR GETINT          NEXT TRACK
C317 A6 06 1E  **          LDA $1E,X
C31A 4C  **          INCA
C31B A1 C9 0008  **          CMFA TRACKS,U
C31F 23 F3  **          REDINT          LOOP THRU TRACKS
C321 39  **          RTS
          **
          ** R D SEQUENTIALLY
          **
C322 ED 8B 1E  ** RE0600 STD $1E,X          NEXT TRACK
C325 17 FF39  **          LBSR PRTRK          PRINT TRACK

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C128 17 PP4C REDBNC LBSK OETSEC NEXT SECTOR
C129 2C 8H 1E LBD $1E,X GET TRACK AND SECTOR
C130 9C LBCB ** MAGNETIC EQUATES
C131 27 09 BEO REDBNC 5000 TRACKS EQU $00
C132 2D 08 1E STD $1E,X 0001 SECTORS EQU $01
C133 E1 C9 0002 CHPB SECTORS,U 0002 SECTORS EQU $02
C134 23 2E B1S REDBNC LOOP THRU SECTORS 0001 INTRIC EQU $03
C135 E6 C9 0001 REDBNC LDB SECTORS,U FIX SECTOR COUNT **
C136 E7 C9 0002 STD SECTORS,U ** FLEX ENTRY POINTS
C137 C5 B1 LDB $001 **
C138 4C INCA C040 SYSCB EQU $C040
C139 27 09 BEO REDBNC C00C WRKDRV EQU $C00C
C140 2D 08 1E STD $1E,X C00J WARMST EQU $C00J
C141 A1 C9 0000 CHPA TRACKS,U C013 GETCHR EQU $C013
C142 23 02 BLS REDBNC C018 PUTCHR EQU $C018
C143 19 REDBNC RTS C01E PSTRNG EQU $C01E
C144 19 ** C024 PRCLIF EQU $C024
C145 19 ** C03C OUTHEX EQU $C03C
C146 19 ** C042 GETHEX EQU $C042
C147 19 ** C045 OUTADR EQU $C045
C148 19 ** C046 CALPMS EQU $C046
C149 19 ** END STARTS

C351 10AZ C9 0003 GETINT LDI INTRIC,U POINT TO INTERLACE TABLE
C352 A7 08 1E STA $1E,X TRACK
C353 17 P005 LBSR PRSTRNG PRINT TRACK
C354 E4 C9 0001 LDB SECTORS,U GET SECTOR/TRACK
C355 A6 A0 GETIMS LDA Y, GET NEXT SECTOR
C356 A7 08 1F STA $1F,X SECTOR
C357 A1 C9 0002 CHPA SECTORS,U CHECK SECTOR NUMBER
C358 23 03 BHI GETIMK
C359 17 P009 LBSR GETSEC READ SECTOR
C360 5A DECB DECB
C361 26 0F BNE GETIMS LOOP THRU SECTORS
C362 E6 C9 0001 LDB SECTORS,U FIX SECTOR COUNT
C363 E7 C9 0002 STD SECTORS,U
C364 19 GETIMX RTS

** TRACK/SECTOR TABLE
C37A TRKSEC * MAX TRK/SEC, INTERLACE OFFSET
C37B 220A 02D0 FDB $220A,INT50D-STARTR 35 TRK 10 SEC 5" SSDD
C37C 2214 02D0 FDB $2214,INT50D-STARTR 35 TRK 20 SEC 5" SSDD
C37D 270A 02D0 FDB $270A,INT50D-STARTR 40 TRK 10 SEC 5" SSDD
C37E 2714 02D0 FDB $2714,INT50D-STARTR 40 TRK 20 SEC 5" SSDD
C37F 450A 02D0 FDB $450A,INT50D-STARTR 70 TRK 10 SEC 5" SSDD
C380 4514 02D0 FDB $4514,INT50D-STARTR 70 TRK 20 SEC 5" SSDD
C381 4F0A 02D0 FDB $4F0A,INT50D-STARTR 80 TRK 10 SEC 5" SSDD
C382 4F14 02D0 FDB $4F14,INT50D-STARTR 80 TRK 20 SEC 5" SSDD
C383 2212 02E5 FDB $2212,INT50D-STARTR 35 TRK 18 SEC 5" SSDD
C384 2224 02E5 FDB $2224,INT50D-STARTR 35 TRK 36 SEC 5" SSDD
C385 2712 02E5 FDB $2712,INT50D-STARTR 40 TRK 18 SEC 5" SSDD
C386 2724 02E5 FDB $2724,INT50D-STARTR 40 TRK 36 SEC 5" SSDD
C387 4512 02E5 FDB $4512,INT50D-STARTR 70 TRK 18 SEC 5" SSDD
C388 4524 02E5 FDB $4524,INT50D-STARTR 70 TRK 36 SEC 5" SSDD
C389 4F12 02E5 FDB $4F12,INT50D-STARTR 80 TRK 18 SEC 5" SSDD
C390 4F24 02E5 FDB $4F24,INT50D-STARTR 80 TRK 36 SEC 5" SSDD
C391 4C0F 030A FDB $4C0F,INT80D-STARTR 77 TRK 15 SEC 8" SSDD
C392 4C18 030A FDB $4C18,INT80D-STARTR 77 TRK 30 SEC 8" SSDD
C393 4C1A 0329 FDB $4C1A,INT80D-STARTR 77 TRK 26 SEC 8" SSDD
C394 4C34 0329 FDB $4C34,INT80D-STARTR 77 TRK 52 SEC 8" SSDD
C395 FFFF 0000 TAKEWD FDB $FFFF,$0000,$0000 END OF TABLE

** 5" SD INTERLACE
C3D0 0A INT30 FCB $0A SECTORS ON TRACK 0
C3D1 01 09 05 00 FCB $01,$09,$05,$00,$04,$07,$03,$06
C3D2 02 0A FCB $02,$0A FRONT
C3D3 12 0E 11 0D FCB $12,$0E,$11,$0D,$10,$0C,$14,$08
C3D4 13 0F FCB $13,$0F BACK

** 5" DD INTERLACE
C3E5 0A INT50 FCB $0A SECTORS ON TRACK 0
C3E6 01 0A 02 00 FCB $01,$0A,$02,$00,$03,$0C,$04,$0D
C3E7 05 0E 04 0F FCB $05,$0E,$04,$0F,$07,$10,$08,$11
C3E8 09 12 FCB $09,$12 FRONT
C3E9 16 17 17 20 FCB $16,$17,$17,$20,$18,$21,$19,$22
C3EA 1A 21 10 24 FCB $1A,$21,$1B,$24,$1C,$13,$10,$14
C3EB 1E 15 FCB $1E,$15 BACK

** 8" SD INTERLACE
C40A 0F INT60 FCB $0F SECTORS ON TRACK 0
C40B 01 04 02 05 FCB $01,$04,$02,$05,$03,$06,$09,$07
C40C 0A 08 08 0E FCB $0A,$08,$08,$0E,$0C,$0F,$0E,$0D FRONT
C40D 17 15 10 16 FCB $17,$15,$10,$16,$11,$0F,$14,$10
C40E 18 1E 10 13 FCB $18,$1E,$10,$13,$11,$14,$12,$0F BACK

** 8" DD INTERLACE
C429 07 INT80 FCB $0F SECTORS ON TRACK 0
C42A 01 16 0C 14 FCB $01,$16,$0C,$14,$0A,$12,$08,$10
C42B 06 0E 04 19 FCB $06,$0E,$04,$19,$02,$17,$0D,$15
C42C 08 13 09 11 FCB $08,$13,$09,$11,$07,$0F,$05,$1A
C42D 01 10 FCB $01,$10 FRONT
C42E 2D 23 20 21 FCB $2D,$23,$20,$21,$22,$29,$17,$24,$1D
C42F 32 18 30 26 FCB $32,$18,$30,$26,$2E,$24,$2C,$22
C430 2A 28 20 1E FCB $2A,$28,$20,$1E,$33,$1C,$31,$27
C431 2F 25 FCB $2F,$25 BACK

C45E 54 65 73 74 OPINIS FCC "Test Has Been Completed!"
C45F 07 04 FCC $07,$04
C460 53 79 73 74 OSIRIN FCC "System Info Record is Invalid!"
C461 07 04 FCC $07,$04
C462 44 69 73 6B QSI35B FCC "Diskette Size? (S/D): "
C463 07 04 FCC $07,$04
C464 53 69 6E 67 QSD61D FCC "Single or Double Sided? (S/D): "
C465 07 04 FCC $07,$04
C466 53 69 6E 67 QSD0EN FCC "Single or Double Density? (S/D): "
C467 07 04 FCC $07,$04
C468 53 69 6E 67 QSDTRK FCC "Single or Double Track? (S/D): "
C469 07 04 FCC $07,$04
C470 33 35 20 54 QTRK14 FCC "35 Tracks or 40 Tracks? (3/4): "
C471 07 04 FCC $07,$04
C472 40 61 70 69 QNAXTS FCC "Maximum Track/Sector Read Was: "
C473 07 04 FCC $07,$04
C474 41 72 65 20 QACCPY FCC "Are These Acceptable? (Y/N): "
C475 07 04 FCC $07,$04
C476 44 69 73 6B QHARRG FCC "Disk Test is Suspicious "
C477 07 04 FCC $07,$04
C478 57 69 74 68 Q59E FCC "Without Size!"
C479 07 04 FCC $07,$04
C480 40 61 72 64 QHARPL FCC "Hard Disk or Floppy Disk? (H/F): "
C481 07 04 FCC $07,$04
C482 49 6C 6C 65 QILLON FCC "Illegal Drive Number!"
C483 07 04 FCC $07,$04
C484 44 72 69 76 QMSDEV FCC "Drive Must be Specified!"
C485 07 04 FCC $07,$04
C486 20 20 44 72 QDRVNR FCC "Drive Not Ready!"
C487 07 04 FCC $07,$04
C488 2C 20 53 65 QSDCNF FCC "Sector Not Found!"
C489 07 04 FCC $07,$04
C490 2C 20 43 52 QCRCEC FCC "CRC Error!"
C491 07 04 FCC $07,$04
C492 44 69 73 6B QADRSE FCC "Disk Address: "
C493 07 04 FCC $07,$04

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0 ERROR(S) DETECTED

68 Micro Journal  
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Dear Mr Williams

Having read some borrowed numbers of your magazine it is evident that I have many good friends all over the '68'-hemisphere. My interest started 7 years ago out of sheer necessity to find a suitable tool for my work. In a course I learned how to manage the 6800 microprocessor, and was truly dissatisfied. On the last day in 'school' there was a review of available micro's. One matched my expectations, the Motorola 6800. I had years of experience with programmable calculators with conditional and unconditional jump instructions. I started modestly to build, expand, rebuild, leaving the modesty and ending up with a complete 6809 system with basically everything in it. It is the Swedish make 'PRIMAL DATA PD2000'. If you have not heard of it, listen to this!

- European dimensional standards.
- 6809 with the PD versatile monitor.
- Parallel and Serial interface ports.
- Full memory on ONE board. 8 64k memories!
- On board real time clock.
- Two 5-1/4 disk drives, double side, double density.
- Driver board dimensioned to take another two drives.
- PC-boards are CAD engineered and coated.
- Your choice of terminal although they offer certain std.
- Your choice of printer although - " -
- The number of software available would easily fill this page and more.

In the course of changing between systems I did run into some difficulties. How to preserve and keep track of all disks? I have about 125 disks in operation. For me that's a lot. When I converted to 6809 with the double/double bussiness and the 6800 based disks would not communicate with the disk driver of my new system I was in trouble. I went through the frustrating routine of: Newdisk-1 on the 6809, - put this new disk in the 6800 and copy the old to the new, which worked fine except with .CMD and .SYS files - then repeat the procedure. That took 2 weeks of my vacation!

It was time for some thinking. Don't be afraid, thinking in itself is nothing to worry about. It's the result that is important. And here it is!

- A Disk Numbering System that tells you at a glance:
- Single or Double sided - Single or Double density
  - in which 68xx System it was formatted (readability)
  - Original or Systems disk
  - category of programs or language or both
  - individual disk number of any category

While in 'NEWDISK' you are prompted for the disk number, the highest number accepted is 65535 so you cannot utilize the first digit for the '9' in 6809.

A	B	C	D	E	
1					Single sided / Single density S/S
2					Single sided / Double density S/D
3					Double sided / Single density D/S
4					Double sided / Double density D/D
5					(Reserved for e.g. S/DD)
6					(Reserved for e.g. DD/DD)
A	0				Formatted in 6800
A	x				Formatted in 680x (x = 1 through 9)
A	9				Formatted in 6809
A	B	0	x	n	Systems and Original disks
A	B	C	x	x	C = category or language

Column C is used for categorization. The disks that have a '0' as the third digit are the original systems-, language- and program- disks from which you make the working system disks. You should never come across such a disk; it should be locked in a safe.

Let's focus on the third digit, the one in the C column. Suppose you are programming in Basic and Pascal and that you are using Basic for your Administrative Programs while Pascal is used for processing programs. You will have to reserve enough numbers for each type of programs. As it turns out you have at least twice as many business programs and an additional need for the growing number of data files emanating from your administrative routines. Available numbers are 1 through 9 each allowing 100 disks = 900 disks not counting the 100 Systems disk numbers available with '0' as the third digit. So maybe you will assign 2 and 3 for Basic Administrative Programs and 4, 5, 6 and 7 for Data files. Your Process Control Programs will be assigned the 9. You have saved 1 and 8 equalling 200 disks.

- 4900 would be your most valuable Systems disk.  
- 4910 might be your working Systems disk.

\* 29256 = S/D, 6809, Basic, Administrative, disk No 56. \*  
\* 49456 = D/D, 6809, Basic, Adm - Data, disk No 56. \*

The Numbering System described will allow 1000 (one thousand) disks - of each S/S, S/D, D/S and D/D and when available DD/DD with variations.

Try it. My immediate friends are satisfied. How about the balai

With Kind Regards

Bertil Elvör  
Riksdalareatan 27  
S-36266 LINKÖPING  
SWEDEN



SINGLE DISK COPY FOR UP TO FIVE FILES  
FOR 6809 FLEX.

THIS IS AN EXPANDED VERSION OF DALE PUCKETT'S SINGLE DISK COPY UTILITY FOR 6800 WHICH APPEARED IN AN EARLY ISSUE OF 68 MICRO JOURNAL. THIS VERSION IS FOR 6809 FLEX AND ALLOWS UP TO FIVE FILES TO BE COPIED AT ONCE. IT LOADS AS MANY FILES INTO MEMORY AS IT CAN THEN PROMPTS FOR THE DISK TO BE CHANGED. AFTER SAVING THESE FILES ON THE NEW DISK (THE LAST OF WHICH WILL PROBABLY BE PART OF A FILE) YOU CHANGE DISKS BACK AND IT LOADS SOME MORE FILES INTO MEMORY. SO THE PROCESS CONTINUES UNTIL ALL FILES HAVE BEEN COPIED. THIS IS ESPECIALLY USEFUL FOR COPYING FILES WHICH ARE LARGER THAN THE AVAILABLE MEMORY SINCE FILES ARE TRANSFERRED TO THE NEW DISK IN CHUNKS AS BIG AS THE AVAILABLE MEMORY. RANDOM FILES ARE COPIED AS WELL WITHOUT THE USER NEEDING TO KNOW THAT THEY ARE RANDOM.

COMMAND LINE FORMAT IS AS FOLLOWS

+++SOC FILE1.EXT FILE2.EXT FILE3.EXT

WITH UP TO 5 FILES ALLOWED. ANY MORE ARE IGNORED.

J D CALDWELL  
60 SKERMAN ST  
MARTON  
NEW ZEALAND

SINGLE DISK COPY MANY

15-8-81 TSC ASSEMBLER PAGE 1

```

*****
SINGLE DISK COPY FOR UP TO 5 FILES AT ONCE
INCLUDING RANDOM FILES
*****
USED IN THE PDAM1-
SBC.FILE1.EXT,FILE2.EXT,FILE3.EXT,FILE4.EXT
UP TO 5 FILES MAY BE COPIED AT ONCE.
USES ALL AVAILABLE MEMORY TO MINIMIZE DISK CHANGES.
ANY EXTRA FILES ARE IGNORED.
*****
WARNING
OLD DISK IF THE ONE FILES ARE BEING COPIED
FROM1 SHOULD BE WRITE PROTECTED IN CASE
YOU DON'T CHANGE DISKS CORRECTLY AND TWO

```

```

COPIES OF A FILE ARE PUT ON THE SAME
DISK OR SOME OTHER MASTY SIDE EFFECT1.
IN ALL CASES A FILE MANAGEMENT SYSTEM ERROR
WILL ABORT THE COPYING PROCESS AND MAY
LEAVE OPEN FILES ON THE OTHER DISK.

```

FLEX 9.0 EQUATES

```

003  NAMEB  EQU  $C003
0015 DETOR  EQU  $C015
0018  PUTCH  EQU  $C018
001E  PTRNB  EQU  $C01E
0021  CLAB  EQU  $C021
0024  PCRLF  EQU  $C024
002D  GETFIL  EQU  $C02D
003F  RPTERR  EQU  $C03F
0014  LINBP  EQU  $C014
0403  FMSCLB  EQU  $D403
0406  FMS  EQU  $D406
0C2B  MEMEND  EQU  $CC2B      END OF AVAILABLE RAM

```

FILE CONTROL BLOCKS

P22 OF ADVANCED PROGRAMMER'S GUIDE SAYS THEY  
MUST NOT BE IN PAGE 0.

ODD NUMBER FCBS ARE OLD DISK FCBS  
EVEN NUMBER FCBS ARE NEW DISK FCBS

```

0100  ORG  $0100
0100  FCB1  RMB  320      FILE #1
0240  FCB2  RMB  320
0300  FCB3  RMB  320      FILE #2
0400  FCB4  RMB  320
0600  FCB5  RMB  320      FILE #3
0740  FCB6  RMB  320
0800  FCB7  RMB  320      FILE #4
0900  FCB8  RMB  320
0B00  FCB9  RMB  320      FILE #5
0C40  FCB10 RMB  320
0D00  PSINT  EQU  1

```

BEGINNING OF PROGRAM AND ENTRY POINT

```

C100  ORG  $C100
C100 20 2E  SBC  BRA  OPENAL
C102 01  VN  FCB  1
C103 0000  CURFCB  FDB  0      1LMB FCB POINTER STORAGE
C105 01  ROPTR  FCB  1      READ FILE POINTER (1-51)
C106 01  WRPTR  FCB  1      WRITE FILE POINTER (1-51)
C107 00  TOTFL  FCB  0      TOTAL NUMBER OF FILES
C108 0000  STRT1  FDB  0      MEMORY START ADDRESS FOR EACH FILE
C10A 0000  STRT2  FDB  0
C10C 0000  STRT3  FDB  0
C10E 0000  STRT4  FDB  0
C110 0000  STRT5  FDB  0
C112 0000  END1  FDB  0      MEMORY END ADDRESS FOR EACH FILE
C114 0000  END2  FDB  0
C116 0000  END3  FDB  0
C118 0000  END4  FDB  0
C11A 0000  END5  FDB  0
C11C 0100  PFCB1  FDB  FCB1  POINTERS TO FCBS
C11E 03 0  PFCB3  FDB  FCB3  EASIER TO HAVE TABLE THAN
C120 0600  PFCB5  FDB  FCB5  ADD 320 BYTE OFFSET SEVERAL
C122 0800  PFCB7  FDB  FCB7  TIMES
C124 0800  PFCB9  FDB  FCB9
C126 0240  PFCB2  FDB  FCB2
C128 04C0  PFCB4  FDB  FCB4
C12A 0740  PFCB6  FDB  FCB6
C12C 09C0  PFCB8  FDB  FCB8
C12E 0C40  PFCB10 FDB  FCB10

```

```

C130 8D 0B  OPENAL  BSR  OPEN  OPEN ALL FILES FOR READ
C1 2 23 7B  RCB  READ
C134 FA C107  LDB  TOTFL  GET FILE COUNT
C137 C1 05  CMPB  #5
C139 27 71  BEO  READ
C13B 20 F3  BRA  OPENAL
C13D 10BE C 14  OPEN  LDY  LINBP  SAVE LINE BUFFER POINTER
C141 A6 A4  LDA  ,Y  TEST THE NEXT CHAR
C143 8D C021  JSR  CLAB5
C146 24 01  BCC  OPEN1
C148 39  RTB
C149 7C C107  OPEN1  INCB  TOTFL  INC. TOTAL FILE COUNT
C14C FA C107  LDB  TOTFL  CALC FCB
C14F BE C11C  LDY  #PFCB1  LOAD BASE ADDR
C152 8D 49  BSR  CALFCB  CALC FCB ADDR
C154 8D C02D  JSR  GETFIL
C157 25 4A  BCS  ERROR
C159 10BF C114  STY  LINBP  RESTORE LINE BUFFER POINTER
C15B BE C126  LDY  #PFCB2  SET UP 2ND FCB WITH SAME NAME
C160 FA C107  LDB  TOTFL
C163 8D 39  BSR  CALFCB  CALC OUTPUT FCB ADDR
C165 8D C02D  JSR  GETFIL
C168 25 39  BCS  ERROR
C16A 6D 0C  TST  12,X  CHECK THERE IS AN EXTENSION
C16C 26 0C  BNE  OPEN2
C16E BE C349  LDY  #EXTSTR
C171 8D C01E  JSR  PTRNB
C174 8D D403  JSR  FMSCLB
C177 7E C003  JMP  NAMEB  RETURN TO DOS
C17A BE C126  OPEN2  LDY  #PFCB2
C17D FA C107  LDB  TOTFL  CALC FCB
C180 8D 1B  BSR  CALFCB  CALC FCB
C182 AF 02  CLY  2,X  MAKE SURE NOT OPEN FOR WRITE
C184 BE C11C  LDY  #PFCB3  OPEN FOR READ

```



# THE COMPLETE BUSINESS SYSTEM

## + Multiuser + Highly Expandable + Cost Effective

### S+ THE CONCEPT

The S+ system is a modular computer system in which all portions of the hardware and software are designed to work together in the most efficient way possible. An S+ single user system with floppy disk storage is a competitive and cost effective entry level system. Unlike most other small computers being sold as "personal", or "small business" machines, the S+ system may be expanded to maximum capabilities using this same hardware and software. You cannot end up with a DEAD END system that cannot be expanded and whose software is not compatible with larger machines. A basic S+ system may be expanded to thirty-two users, a megabyte of main memory and hundreds of megabytes of hard disk storage by simply plugging in, or connecting the desired upgrade equipment.

### TOTAL DESIGN—Hardware and Software

The S+ system is an integrated hardware and software design. The two complement and enhance each other in this system. The UniFLEX® operating

system used in the S+ systems is patterned after the Bell Laboratories UNIX® operating system, one of the most admired and widely used operating systems in the world. Instead of being an afterthought, the software is part of the design of the S+ system. You can be sure that with this approach that all parts of the computer operate with maximum efficiency and cost effectiveness.

### THE CENTRAL PROCESSOR

The basic S+ system is configured with 256K bytes of memory and can be expanded to more than 1 million bytes. An efficient and fast hardware memory management system is used to allocate the available memory among the users on a dynamic basis. As little as 8K bytes, or the entire memory—if needed—can be used by any individual user. This makes it possible to run very large programs on the system, but it also uses no more memory than necessary for a particular job. The increase in cost effectiveness of this system over crude and outdated bank switching arrangements is dramatic.



The central processor runs in both user and supervisor states. It can detect and reject a defective user program. It is impossible for a user program to go bad and stop the entire system, as can happen quite easily in less sophisticated systems.

Task switching is accomplished by use of a multiple map RAM memory, with sixty-four individual task maps. Each task can access from 4 to 64 K-bytes of memory. Multiple tasks may be used in programs that require more than 64K bytes of memory for execution. When a task is completed the memory is automatically released for other use.

### SOFTWARE

The S+ operating system, UniFLEX® is a multiuser, multitasking operating system based on the UNIX® operating system that has been used for many years on Digital Equipment Corp. PDP-11 series minicomputers. It is considered one of the most sophisticated and "user friendly" operating systems available. Variations of UNIX® are rapidly becoming standard on mini and larger microcomputers.

A large variety of languages are available for use with the system. These include FORTRAN, COBOL, BASIC, and Pascal. Word processing packages are also available to give you full text processing capability on the system.

Applications programs are available in large quantities in many fields. This includes general business, medical, dental, veterinary, library and real estate management; plus others. Since the system is multiuser it can also be connected to cash registers to produce a point-of-sale terminal system combined with the computer. The possibilities for application of this system are endless.

### THE I/O SYSTEM

The S+ system is totally interrupt driven. All terminal and printer I/O devices connect to an I/O bus separate from the main bus. Up to thirty-two separate devices may be connected to the I/O bus at any one time. If I/O activity is great enough to cause an unacceptable slowdown in system operation, a separate I/O processor can be installed in the system. This plug-in option removes all I/O handling

overhead from the main processor and allows operation of up to thirty-two external devices at 9,600 baud. Without an integrated total design, as in the S+ system, it would become impractical to use a UNIX® type operating system in a situation with heavy terminal I/O activity.

### DISK STORAGE

A wide range of disk storage capacity is available for the S+ system, from 2.5 M-byte floppy disks to an 80 M-byte Winchester and many sizes between. All disk controllers use direct memory access (DMA) type operations to maximize data transfer and to minimize overhead on the main processor. The Winchester disks also use intelligent controllers along with DMA transfers to preserve the performance that these type devices are capable of giving. Without this distributed intelligence the system performance would be greatly degraded. The UniFLEX® operating system is designed to work at maximum efficiency with this type disk system. The data transfer rates achieved by this combination rival those of large minicomputers.

### COMMUNICATIONS

A high speed local network communications system is available to interconnect S+ systems. The VIA-BUS® network will allow communication between systems at data rates of over 400K baud. Such a system makes it possible to share data between local systems in an efficient and low-cost manner.

### AVAILABLE SOON

Tape backup—20M-Byte in less than 15 minutes on a standard ¼ inch cartridge.

Mini-Wini—5 and 10 M-Byte Winchesters—5¼ inch package. Winchester performance, for smaller systems in a small package. UniFLEX® compatible design.

Large Capacity—190 and 340 M-Byte Winchesters, plus SMD cartridge drives.

*UniFLEX is a registered trademark of Technical Systems Consultants, Inc.*

*UNIX is a registered trademark of Bell Labs.*

*VIABUS is a registered trademark of Southwest Technical Products Corporation.*



**SOUTHWEST TECHNICAL PRODUCTS CORPORATION**  
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SAN ANTONIO, TEXAS 78216

(512) 344-0241

THE MOTOROLA MEK 6800 D2 KIT  
& MIKBUG FORMATTED TAPES

ONE OF THE MAJOR PROBLEMS THE D2 USER IS FACED WITH IS NOT BEING COMPATIBLE WITH ANYBODY BUT OTHER D2'ERS. IT IS DIFFICULT TO TAKE ADVANTAGE OF EXISTING 4800 SOFTWARE BECAUSE MOST OF IT IS WRITTEN FOR A MIKROG DRIVEN SYSTEM.

IT IS NOT DIFFICULT TO MAKE THE NECESSARY PATCHES TO MAKE THESE PROGRAMS RUN ON THE 02. MODERATE THE ONLY WAY YOU ENTER THESE PROGRAMS INTO THE SYBTEM IS THROUGH THE KEYBOARD. THIS IS A TEDIOUS AND ERROR PRONE PROCEDURE. IT IS POSSIBLE UNDER PROGRAM CONTROL, FOR THE 02 TO PUNCH AND READ MINIBU, S1, FORMATTED TAPES UTILIZING THE EXISTING CASSETTE INTERFACE.



```

* CARRIAGE RETURN/LINE FEED *
$ CRLF LDX @MESS3 GET MESSAGE
$0005 CE 5F 85 JMP SSTRING WRITE IT
$0008 7E E1 30

* GET BEGINNING & ENDING ADDRESSES *
$0008 DD 60 05 PUNCH JSR CRLF
$000E CE 5F 5F LDX @MESS1 GET A MESSAGE
$0011 80 E1 30 JSR SSTRING WRITE A MESSAGE
$0014 DD 5F D3 JSR ADD SET MS
$0017 CE A0 02 LDX @BEGA
$001A A7 00 STAA ,X SAVE MS
$001C 00 INX
$001D DD 5F D3 JSR ADD GET LS
$0020 A7 00 STAA ,X SAVE LS
$0022 DD 60 05 JSR CRLF
$0025 CE 5F 73 LDX @MESS2
$0028 DD E1 30 JSR SSTRING WRITE IT
$002B DD 5F D3 JSR ADD GET END MS
$002E CE A0 04 LDX @BENDA
$0031 A7 00 STAA ,X SAVE ENDING MS
$0033 00 INX
$0034 DD 5F D3 JSR ADD GET END LS
$0037 A7 00 STAA ,X SAVE ENDING LS
$0039 DD 60 05 JSR CRLF
$003C CE 5F 1E LDX @TAPE GET A MESSAGE
$003F DD E1 30 JSR SSTRING WRITE IT
$0042 DD 61 A9 AGAIN1 JSR INCH READ IT
$0045 01 00 BNE AGAIN1 LOOK FOR CR
$0047 26 F9 JSR CRLF
$0049 DD 60 05 JSR CRLF
$004C DD 60 05 LDRAR @2 JBUG KEY
$004F C6 02 JSR MONACC GET JBUG
$0051 DD 60 FE

* START PUNCH HERE *
$0054 86 51 LDAA @S1 @BIT,2 STOP,1/16
$0056 B7 80 08 STAA ACIA INITIALIZE TAPE PORT
$0059 B7 5F 08 STAA ACIAIN TEMPORARY SAVE
$005C CE 03 00 LDX @00300 SET FOR 1/2 MIN.
$005F DD E3 80 JSR PMLDR PUNCH LEADER F'S
$0062 FE A0 02 LDX @BEGA GET START ADD.
$0065 FF 5F 03 STX TEMP SAVE IT
$0068 86 A0 05 PUN11 LDAA @BENDA GET END ADD.
$006B 80 5F 04 SUBRA TEMP SUBTRACT IT
$006E F6 A0 04 LDAB @BENDA
$0071 F2 5F 03 BNE PUN22
$0074 26 04 BNE CMFA
$0076 01 10 BCS PUN23
$0078 25 02 LDAA @00F
$007A 86 0F PUN22 ADDA @004
$007C 8B 04 STAA @CONT
$007E B7 5F 05 SUBA @003
$0081 80 03 STAA @BYTCNT
$0083 B7 5F 07 LDX @TAPE1
$0086 CE 5F 0C JSR PDATA1
$0089 DD 61 22 BNE ZERO
$008C 20 00

* PUNCH FRAME COUNT *
$008E 3F ZERO CLRDR
$008F CE 5F 05 LDX @NCONV
$0092 DD 60 C5 JSR PUNT2 ZERO CHECKSUM
GET FRAME COUNT
PUNCH FRAME COUNT

* PUNCH ADD EBB *
$0095 CE 5F 03 LDX @TEMP
$0098 DD 60 C5 JSR PUNT2 PUNCH ADDRESS MS
$009B DD 60 C5 JSR PUNT2 PUNCH ADDRESS LS

* PUNCH DATA *
$009E FE 5F 03 PUN32 LDX TEMP
$00A1 DD 60 C5 JSR PUNT2 PUNCH 10 BYTE, 2 FRAMES
$00A4 7A 5F 07 DEC BYTCNT
$00A7 26 F8 BNE PUN32
$00A9 FF 5F 03 STX TEMP
$00AC 53 COMB
$00AD 37 PSNB
$00AE 30 TSX
$00AF DD 60 C5 JSR PUNT2 PUNCH CHECKSUM
$00B2 33 PULB RESTORE STACK
$00B3 FE 5F 03 LDX TEMP
$00B6 09 DEX
$00B7 8C A0 04 CPX @BENDA
$00BA 26 AC BNE PUN11
$00BC CE 5F 15 LDX @TAPE1 GET END '89'
$00BF DD 61 22 JSR PDATA1 WRITE IT
$00C2 7E 61 16 JNP COMIRL

* PUNCH 2 HEX CHAR, UPDATE CHECKSUM *
$00C5 EB 00 PUNT2 ADDB ,X UPDATE CHECKSUM
$00C7 A6 00 LDAA ,X SET IT
$00C9 DD 60 D2 JSR @QUIML OUTPUT HEX LEFT
$00CC A6 00 LDX @X
$00CE 08 JNP @OUTHR OUTPUT HEX RIGHT
$00CF 7C 60 06 OUTHL LBRA
$00D2 44 LSRAR
$00D3 44 LSRAR
$00D4 44 LSRAR
$00D5 44 LSRAR
$00D6 84 0F OUTHR ADDA @00F
$00D8 8B 30 ADDA @030
$00DA 81 39 CMFA @039
$00DC 23 02 BLS @OUTCH1
$00DE 8B 07 ADDA @007

* SAVE IT *
$00E0 DD E3 7A OUTCH1 JSR OUTCH JBUG ROUTINE

* ECHO AT TERMINAL *
$00E3 37 ECHO PSNB
$00E4 C6 01 LDAB @001
$00E6 DD 60 FE JSR MONACC
$00E9 C6 11 LDAB @011
$00EB F7 80 08 STAB ACIA
$00EE DD E1 08 JSR OUTCHM
$00F1 C6 02 LDAB @002
$00F3 DD 60 FE JSR MONACC
$00F6 F6 5F 08 LDAB ACIAIN
$00F9 F7 80 08 STAB ACIA
$00FC 33 PULB
$00FD 39 RTS

* MONITOR ENABLE *
$00FE 36 MONACC PSNB
$00FF 4F CLRA
$0100 B7 80 07 STAA PIA1
$0103 43 COMA
$0104 B7 80 06 STAA PIA
$0107 86 04 LDAA @004
$0109 B7 80 07 STAA PIA1
$010C 86 03 LDAA @003
$010E B7 80 06 STAA PIA
$0111 F7 80 06 STAB PIA
$0114 32 PULA
$0115 39 RTS

* CONTROL *
$0116 C6 01 CONTRL LOAB @01
$0118 DD 60 FE JSR MONACC
$011B 7E E0 40 JNP MINBUG

* PUNCH A STRING *
$011E DD 60 E0 PDATA2 JSR OUTCH1
$0121 08 INX PUNCH ONE
$0122 A6 00 PDATA1 LDAA ,X
$0124 81 04 CMFA @4 LOOK FOR END
$0126 26 F6 BNE PDATA2 PUNCH ANOTHER
$0128 39 RTS STOP ON EOT

* START READ HERE *
$0129 86 10 READ LDAA @010
$012B B7 80 08 STAA ACIA
$012E B7 5F 08 LDAB @011
$0131 DD 76 B R IN H
$0133 81 53 CMFA @0'S
$0135 26 FA BNE LOAD3
$0137 DD 60 E3 JSR ECHO
$013A DD 60 BSR INCH
$013C 81 39 CMFA @0'S
$013E 26 06 BNE START1
$0140 DD 60 E3 JSR ECHO
$0143 7E 61 16 JNP CONTRL
$0146 81 31 START1 CMFA @1
$0148 26 E7 BNE LOAD3
$014A DD 60 E3 JSR ECHO
$014D 7F 5F 08 CLR CHKSUM
$0150 DD 3A BSR BYTE
$0152 DD 02 SUBA @2
$0154 B7 5F 07 STAA BYTCNT
$0157 DD 25 BSR BADDR
$0159 DD 31 BSR BYTE
$015B 7A 5F 07 DEC BYTCNT
$015E 27 09 REG LOAD15
$0160 A7 00 STAA ,X
$0162 A1 00 CMFA ,X
$0164 26 08 BNE ERROR1
$0166 08 INX
$0167 20 F0 BRA LOAD11
$0169 7C 5F 08 INC CHKSUM
$016C 27 03 REG NEWLN
$016E 7E 61 B2 ERROR1 JNP ERROR
$0171 86 00 NEWLN LDAA @000
$0173 DD 60 E3 JSR ECHO
$0176 86 0A LDAA @00A
$0178 DD 60 E3 JSR ECHO
$017B 7E 61 31 JNP LOAD3

* BUILD ADDRESS *
$017E DD 0C BADDR BSR
$0180 B7 5F 09 BSR BYTE
$0183 DD 07 BSR BYTE
$0185 B7 5F 0A STAA XLOW
$0188 FE 5F 09 LDX XHI
$018B 39 RTS BACK TO ALLER

* READ ONE BYTE *
$018C DD 2C BYTE BSR
$018E 48 ASLA
$018F 48 ASLA
$0190 48 ASLA
$0191 48 TAB
$0192 16 JNP INH
$0193 DD 61 8A JSR INH
$0196 19 ASLA
$0197 16 TAB
$0198 DD 5F 08 ADDB CHKSUM
$0199 F7 5F 08 STAB CHKSUM
$019C 39 RTS GO HOME

* INPUT ONE BYTE *
$019F B6 80 08 INCHR LDAA ACIA
$01A2 47 ASRA
$01A3 24 FA BCC INCHR
$01A5 B6 80 09 LDAA ACIA1
$01A8 39 RTS RCVR NOT READY
INPUT CHARACTER
BACK TO ALLER

* INPUT ONE BYTE & CHECK *

```



```

61A9 B9 F4      INCH      BSR      INCHR      GO GET ONE
61AB 84 7F      ANDA      ##7F
61AD 81 7F      CMPA      ##7F
61AF 27 FB      BEQ      INCH      RUB OUT AND DELETE
61D1 39          RTS          BACK HOME

* ERROR ROUTINE *
61B2 8A 3F      ERROR      LDAA      0?      GET A ?
61B4 8D 60 E3      JSR      ECHO      ?
61B7 7E 61 16      JMP      CONTRL

* ASCII TO HEX *
61BA 8D ED      INMEX      BSR      INCH      GO GET ONE
61BC 8D 60 E3      JSR      ECHO      ECHO AT TERMINAL
61BF 80 30      SUBA      ##30
61C1 2B EF      BMI      ERROR      OT HEX
61C3 81 09      CMPA      ##09
61C5 2F 0A      BLE      INING
61C7 81 11      CMPA      ##11
61C9 2B E7      BMI      ERROR
61CB 81 16      CMPA      ##16
61CD 2E E3      BCT      ERROR
61CF 80 07      SUBA
61D1 39          INING      RTS      GO DME
END
ND ERROR(S) DETECTED

```

#### SYMBOL TABLE:

AC1A	0008	AC1A1	0009	AC1A1N	5F08	A0D	5FD3
AGAIN	5FBE	AGAIN1	6042	BADPR	617E	BEGA	A002
BEGIN	5F9B	BYTCNT	5F07	BYTE	618C	CHKSUM	5F08
CONTRL	6116	CRLF	6005	ECHO	60E3	ENDA	A004
ENDA1	A005	ERROR	61B2	ERROR1	616E	GOHOM	5FF8
HEXBYT	5FE0	INCH	61A9	INCHR	619F	INMEX	61BA
INING	61D1	LOAD11	6159	LOAD15	6169	LOAD3	6131
MCONT	5F05	MESS1	5F5F	MESS2	5F73	MESS3	5FB5
MESSNX	5FB8	MINBUG	6040	MONACC	60FE	MTAPE1	5F0C
NEWLN	6171	NOTHEX	5FF9	OUTCH	E37A	OUTCH1	60E0
OUTCHM	E108	OUTHL	60D2	OUTHR	60D6	PDATA1	6122
PDATA2	611E	PIA	8006	PIA1	8007	PWLDR	E38D
PUN11	6068	PUN22	607A	PUN23	607C	PUN32	60A1
PUNCH	600B	PUNT2	60C5	READ	6129	START1	6146
STRING	E130	TAPE	5F1E	TAPEND	5F15	TEMP	5F03
TEMP1	5F04	WMA1	5F3F	XHI	5F09	XLOW	5F0A
ZERO	608E						

Two items for the Color Computer are reviewed here. They both fill a need for the color computer user, the CPRINT Parallel Printer Interface allows a parallel printer (such as the Epson MX series) to be interfaced to the color computer without the added expense of more expensive serial configuration for parallel printers.

The CMEMORY Extended RAM/EPROM Cartridge for the color computer may be used either with the newer 2Kx8 RAM (2016,4016) or EPROM (2716,2516) which is established as an industry standard.

(Note: because of the complete details included in the instruction sheets, they are reproduced here)

#### CMEMORY Extended RAM/EPROM Cartridge For the TRS-80 Color Computer

#### INTRODUCTION:

The CMEMORY module is designed to plug into the Program Pak (tm) slot on the right side of the TRS80C. Once attached, CMEMORY gives you up to 8K bytes of continuous memory. This memory can be divided up into 8K of EPROMs or 6K of EPROMs and 2K of RAM. Now you can save your favorite utilities or games in easy to use cartridges. For example, one might save a communications package, editor/assembler, disassembler, and/or monitor on an EPROM. The cartridge might be filled with RAM while debugging a program and then replaced by an EPROM once it is completed. The CMEMORY with RAM installed can also be used for storing machine language subroutines used by a Basic program.

#### TECHNICAL DETAILS:

The first thing you will probably want to do is remove the single screw from the top of the CMEMORY cartridge and look at the board inside. You will be able to see the four empty 24 pin sockets where you will put your RAM/EPROM IC's.

The extended RAM/EPROM occupies the unused address space \$C000 to \$DFFF normally reserved for plug-in game cartridges. This address range is divided up into four 2048 byte blocks, each block corresponding to one IC socket. With the board such that the connector is furthest from you, the leftmost socket corresponds to the address range \$C000-\$C7FF. The next socket to the right is \$C800-\$C7FF. The next one is \$D000-\$D7FF and the rightmost one \$D800-\$DFFF.

Any single supply five volt 2K x 8 2716 type EPROM can be used provided it has an access time of 350 ns or faster. The new 2K x 8 RAM IC's such as the 2016 made by Toshiba or the 4016 made by TI will all work in the CMEMORY board provided they have an access time of 350 ns or faster (most of them do). In addition, ROMs and PROMs which are designed to replace 2716 type EPROMs can also be used if they meet the access time requirement of 350 ns. All of these different types of IC's may be placed in any of the four sockets in any combination. The only limitation is that only one of the four sockets can be used to hold RAM. NOTE: compatible EPROMs and RAM IC's may be ordered from Micro-Labs.

There is, however, a small problem which you must work around when using RAM. If you are executing a Basic or Extended Basic program, there is a software bug which sometimes causes the 1886th byte in the 2K block of of RAM to be written over. This corresponds to the addresses \$C75D, \$C75D, \$D75D, and \$D75D. If you are using EPROMs or executing machine language only programs, you don't have to worry.

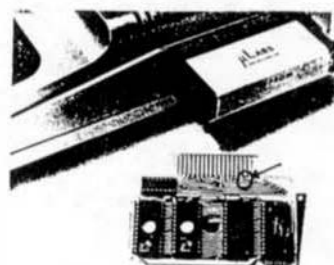
A neat feature of the CMEMORY cartridge is that you can have the computer automatically jump to a program in EPROM located at \$C000 whenever the computer is turned on or the reset button is pressed, just like the Radio Shack game cartridges do. To make this happen, solder a short jumper wire between the connector pins 7 and 8. The two holes made in the circuit board for this purpose are circled in the accompanying figure.

#### OPERATION

Once you've put some IC's in the cartridge, you can screw it back together and use it. Just make sure that you NEVER insert or remove the cartridge while the power to the computer is on. Just like with the Radio Shack cartridges, you can PRY the microprocessor and other components inside if you do.

That's all there is to it. Have fun using your newly expanded computer.

Ted Carter  
Micro-Labs, Inc.  
902 Pinecrest  
Richardson, TX 75080



CPRINT  
Parallel Printer Interface  
for the TRS-80 Color Computer

#### INTRODUCTION:

The CPRINT module is designed to plug into the Program Pak (tm) slot on the right side of the TRS80C. Once attached, CPRINT gives you a plug compatible Centronics type parallel printer port for use with all parallel Radio Shack, Epson, Centronics, and similar printers. In addition, CPRINT is a full 8-bit, bi-directional port, and can be used for virtually ANY application requiring 8-bit data transfer. Some possible applications will be discussed later in the Technical Information section.

#### INSTALLATION:

##### First, TURN OFF THE COMPUTER!

Any time you are inserting or removing CPRINT (or any other device which plugs into the ROM Pak Slot), be sure that the TRS80C is turned off. Take it from experience, you can PRY the microprocessor and other components inside if you leave the power on!

Now, insert CPRINT into the slot in the direction indicated on the label, and plug the printer cable onto the exposed edge connector, with the cable exiting downward.

## OPERATION:

Turn on the printer and the computer, and wait for the "OK" prompt. Now type: EXEC 49152. The screen will clear, and the prompt will reappear, indicating that CPRINT's printer driver is active. If you are planning to use the printer driver, this step should be performed before any programs are loaded or typed in, as the printer driver CLEARS the memory when it executes, and will wipe out any resident BASIC program.

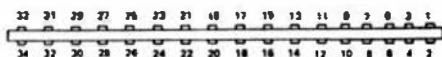
All the normal TRS80C printer commands (i.e., LIST, PRINT#-2) will now be directed to the parallel printer. (Machine language programs using printer output should function as expected unless they contain printer drivers which do not make use of the TRS80C's internal code, in which case, they may not operate correctly.)

CPRINT allows "forms control" for printer output, using the following addresses. To change the "Default" value (that supplied by CPRINT's software, as indicated in the "Value" column), use the BASIC POKE statement (e.g., POKE address, value) into the specified memory location:

Address (all values are decimal)	Value	Function
155	132	Line length (characters per line)
192	058	Page length (lines per page)
194	007	Page spacing (lines between pages) - 1
195	001	Line spacing (blank lines) + 1

## LINE PRINTER CARD-EDGE SIGNALS

PIN	SIGNAL NAME	DESCRIPTION
1	DATA STROBE*	A 1.0 microsecond pulse used to clock the data from the printer
2	GND	Signal ground
3	D1 (OUT)	LSB of the output data lines
4	GND	Signal ground
5	D2 (OUT)	Output data line
6	GND	Signal ground
7	D3 (OUT)	Output data line
8	GND	Signal ground
9	D4 (OUT)	Output data line
10	GND	Signal ground
11	D5 (OUT)	Output data line
12	GND	Signal ground
13	D6 (OUT)	Output data line
14	GND	Signal ground
15	D7 (OUT)	Output data line
16	GND	Signal ground
17	D8 (OUT)	MSB of the output data lines
18	GND	Signal ground
19	D4 (IN)	Input data line
20	GND	Signal ground
21	D8 (IN) = BUSY	Input data line. Also shows printer status
22	GND	Signal ground
23	D7 (IN) = OUT OF PAPER	Input data line, out of paper indicator.
24	GND	Signal ground
25	D6 (IN) = UNIT SELECT	Input data line, shows if the printer is selected.
26	NC	Not connected
27	GND	Signal ground
28	D5 (IN) = FAULT*	Input data line, indicates a printer error condition.
29	D3 (IN)	Input data line
30	D2 (IN)	Input data line
31	GND	Signal ground
32	D1 (IN)	Input data line
33	GND	Signal ground
34	GND	Signal ground



(NOTE: Each time a printer operation is completed, the counters are initialized to the starting condition. So some programs that use both video and printer output will not keep track of these values. However, the LIST command will use the values to produce well-formatted program listings.)

## SCREEN PRINT:

CPRINT provides you with the ability to print the contents of the Video display to the printer by pressing the "Down Arrow" and "D" keys at the same time. After completing the printout, the cursor will resume flashing. Press "Break" or "Enter" before typing in anything else, since the last line entered will be ignored unless one of these keys is pressed first.

\*\*\*

Any printer operation can be stopped with the "Break" key. Thus if no printer is attached, or the printer is not ready, the computer will not "hang up". To restore the normal "serial" printer driver, you must turn off the power to the TRS80C.

Some people have found that RF interference appears on the TV screen during printing. This can be lessened by using a twisted or shielded printer cable and/or shortening the cable. When not printing, you can unplug the cable from CPRINT provided that you don't jiggle or move the CPRINT cartridge from where it is plugged into the computer.

## TECHNICAL INFORMATION:

CPRINT actually decodes an 8-bit address in the TRS80C, at memory location 65344 decimal (6FF40). This address is available any time CPRINT is plugged in, even if the printer driver is not activated. When used with a parallel printer, the following bit locations are status indicators:

- Bit 7 - Busy/ready line
- Bit 6 - Out of paper
- Bit 5 - Unit Select line
- Bit 4 - Printer Fault

Other parallel devices designed for the Model I/III, such as disk drives, Percom's Speak 2-Me-2 interface, and so on, may use all 8 bits for other purposes, or you may design your own parallel devices to take advantage of this address, using the accompanying pin diagram. You can also write software which allows you to use a modem and printer at the same time. The printer driver software can be replaced with your own custom driver by programming a new 256 x 8 PROM (part # 745471 or T8P28122). The PROM is addressed at 49152 (\$C000).

Ralph Burris  
June, 1981  
for Micro Labs, Inc.  
902 Pinecrest  
Richardson, TX 75080

Dear Mr. Williams:

I am writing to support Mr. Weller's "complaint" regarding your practice of reducing the size of letters, listings, etc. to half-size or less. This practice does make some of the submittals hard to read.

The Practice is logically inconsistent in that if a submittal is in a multi-column format, you print it as-is. If the submittal is not formatted in columns, then you photo-reduce it. The unreduced, columnized submittals then take as much space as if the same content were not columnized and printed full size.

All publishers admonish their submitters to provide clean copy. I notice that some of your submitters do not even bother to clean the type faces of their printers, resulting in letters such as "e" and "n" having a cruddy appearance.

What has become of your project to formally standardize the \$8-\$10 and \$5-\$10 buses? Does the Hazelwood \$5-\$10 bus prospect add any impetus to standardization?

Sincerely yours,

*Everett M. Greene*  
Everett M. Greene  
504 N. Mono  
Ridgecrest, Ca. 93555

1818 N.E. Fremont  
Portland, OR 97212  
Nov. 16, 1981

Dear Don,

An item for your Bit Bucket! I have trouble holding down the Ctrl button and the keys on the right of my keyboard since my right side is paralyzed. Maybe your readers would be interested.

The program is named C-CMD for ease of calling and the format is either C FV or you can call C and enter a number of 'things' before you exit the program with an Escape. Using the CT-82 from SWTPC, I can draw lines, change formats, change baud rate, etc. before exiting. This is one of my first attempts at Assembly Language programming and it was fun!

Thank you.

Yours truly,

*Gary Lemoine*  
Gary Lemoine

CONTROL CHARACTERS FROM ALPHA'S

11-16-81 4:00PM G L LEMOINE 1

	EQUATES	
AD03	WAKMS EQU	\$AD03
AD27	NXTCH EQU	\$AD27
AD24	PCRLP EQU	\$AD24
AD18	PUTCHR EQU	\$AD18
AD15	GETCHR EQU	\$AD15

```

A100          ORG 0A100
A100 20 00   START BNA NEXT
A102 02      VN FCB 2
A103 00      FLAG FCB 0
A104 00 00   STRKING FCB 0,0,0,0 * STRING INTO WHICH GUES ALPHAS
A104 00 00
A104 00 00
A10C 00      STRFIN FCB 00 * END OF STRING FLAG
A10D 00 AD 27 NEXT JBR NXICH
A110 34      PSM A
A111 01 00   CMP A 000
A113 27 06   BEQ ST00V IF CR GOTO MAIN PROGRAM
          * AND WAIT FOR ESCAPE
A113 36      PSM A
A114 7C A1 03 INC FLAG
A119 20 E3   ST00V TST FLAG
A119 70 A1 03 ST00V JNE START2
A120 CE A1 04 ST00V LDX #STRING
A123 00 AD 15 GET JBR LETCHR
A124 01 00   CMP A 000 CHECK IF <CR>
A126 27 1A   BEQ CALL
A12A          PCONT EQU 0
A12A 04 1F   AND A 001F
A12C A7 00   STA A 01X
A12E 08      INX
A12F 20 F2   BNA GET
A131 CE A1 0C START2 LDX STRFIN
A134 09      START3 BNA FLAG
A135 7A A1 03 JEC
A138 32      PUL A
A139 04 1F   AND A 001F
A13B A7 00   STA A 01X
A13D 7D A1 03 PSI FLAG
A140 27 02   MEM LXT
A142 20 F0   BNA START3
A144 CE A1 04 EXIT LDA #STRING
A147 06 00   EXIT LDA A 01X
A149 00      INX
A14A 80 AD 1D JBR PUTCHR
A14B 0C A1 0C JBR 95KIF IN
A150 26 F5   JBR EXIT
A152 0D AD 15 JBR GETCHR
A155 01 10   LMP A 001B IS IT ESCAPE?
A157 24 03   BNE CLSTR
A159 7E AD 03 JBR WARMY
A15C CE A1 04 CLSTR LDA #STRING
A15F 0F 00   LOOP LEX CLEAR STRING FOR MORE!
A161 00      JBR
A162 0C A1 0C CFX #STFIN
A165 2E F0   BCI LOOP
A167 CE A1 04 LDX #STRING
A16A 20 0C   BNA PCONT FOR ANOTHER PASS
          END START

```

NO ERROR(S) DETECTED

#### SYMBOL TABLE:

```

CLSTR A15C  EXIT A144  EXIT1 A147  FLAG A103  GET A123
GETCHR A15F  LOOP A15F  NEXT A10D  NXICH A027  PCONT A12A
PUTCHR A01B  START3 A134  STFIN A10C  STRKING A104  VN A100
START2 A131  WARMY A003

```

### Electronic Specialists, Inc.

171 South Main Street, Melick, Mass. 01760  
(617) 653-1532

#### NEW PRODUCT RELEASE

FOR IMMEDIATE RELEASE

FOR MORE INFORMATION: FRANK STIFTER

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## Meta Micro

Library Systems, Inc.

#### PRODUCT ANNOUNCEMENT

On-Line File Indexing and Access System for Database Applications

The B-tree Indexing and Access System  
for  
UNIFLEX Pascal Programmers

The B-tree indexing and Access System is the UNIFLEX program which provides the tools needed to build, maintain, and use an index to a file of records. As records are added to a file, only number or index keys (sequences of up to 64 characters) may be inserted into an index which is maintained as a B-tree of the indexing and Access System. When records are later deleted from the file, their index keys can also be deleted by the indexing and Access System. The B-tree indexing and Access System can retrieve record numbers of all records in a file which have been indexed by a specified search key (exact match) or by keys which begin with the same characters as a search key (partial match). Once the record number is obtained, the record itself can be retrieved with a single disk access.

The B-tree is widely recognized as a very efficient structure for organizing an index to a file. It gives very fast access to any record in a large file indexed by an even larger number of keys. For example, with a file of 30,000 records indexed by 1,000,000 keys, a record indexed by a randomly chosen key can be retrieved in only two disk accesses by the indexing and Access System. The B-tree never becomes unbalanced, so it never needs to be reorganized. Storage utilization is quite high, never less than 50 percent and generally much greater. The keys themselves are maintained in sorted order at all times, so sequential access to records in key order is very simple.

The B-tree indexing and Access System consists of eight compiled UNIFLEX Pascal programs supplied on an 8-inch UNIFLEX disk. One program initializes a B-tree index file. The other seven are designed to be run by another Pascal program. They accomplish key insertion, key deletion, key searching, and sequential reading of keys. Complete documentation is provided in the manuals attached in communicating with each of the seven programs. In addition, the source code for several sample programs that use the indexing and Access System programs is also provided on the disk. The seven programs are also provided in two versions—one for use under the "standard environment" of UNIFLEX Pascal and one for use under the "system environment."

\*UNIFLEX is a trademark of Technical Systems Consultants, Inc.

Price for single CPU license ..... \$325.00  
Manual only ..... \$ 25.00

1818 San Pedro  
San Antonio, Texas 78212  
(512) 736-9309

## HELLX ENTERPRISES

504 FORT DRUM DRIVE • AUSTIN, TEXAS 78745

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IBMPAK is a software package which allows the 6809 FLEX user to read, write, and format IBM 3740 diskettes, utilizing the BDE standard (Basic Data Exchange). The conversion between ASCII and EBCDIC, and the differing directory and file organization translations are made transparent to the user. Hardware requirements include a 6809 FLEX system, two 8 inch floppy disk drives, and either a DMAF1 or a DMAF2 disk controller. IBMPAK lists all or part of an IBM diskette; copies files from IBM to FLEX diskettes; formats diskettes to IBM standard; and copies files from FLEX to IBM diskettes.

The package sells for \$125.00 (documentation only available for \$15.00) from HELIX Enterprises. 504 Fort Drum Drive, Austin, Tx., 78745 (512) 441-6568

## Midwest Scientific Instruments

220 W. Cedar Olathe, Kansas 66061 913-764-3273

#### PRESS RELEASE

TELEX 437049 (MSI A CLAT)

#### MSI ANNOUNCES ITS 3rd ANNUAL DEALER MEETING AND USER SEMINAR

The 3rd annual MSI Dealer Meeting and User Seminar will be held January 17-18-19, 1982 at the Hilton Plaza Inn in Kansas City, Missouri.

The newest MSI Business Computer Systems, featuring large capacity hard disk drives, multi-user capacity, and application software packages will be displayed for those computer dealers who need a high end business computer system.

The meeting agenda will feature presentations from several MSI business computer users and dealers as well as presentations of the latest MSI computer products.

Midwest Scientific Instruments, Inc., a systems manufacturer for over eleven years, is expanding its present network of dealers and distributors. All interested computer dealers and systems houses are invited to attend the dealer meeting.

Reservations for the event are required in advance. Please write to: Midwest Scientific Instruments, Inc., Marketing Department at 220 N. Cedar St. Olathe, Kansas 66061 or phone 800-255-6638 for further information.

Arthur M. Gorski  
2240 S. Evanston Avenue  
Tulsa, Oklahoma 74114  
(918) 743-0113/252-5741

November 16, 1981

'68' Micro Journal  
3018 Hamill Road  
P.O. Box 849  
Hixson, Tennessee 37343

Dear Mr. Williams:

Please find enclosed a copy of CODE9, my 6809 assembler for fig-FORTH systems. I would appreciate it if you could forward it to one of your reviewers. This being my first "commercial" product, I would be interested in any comments from impartial reviewers.

Let me give you some of the background and rationale for CODE9. You may have already noticed that it is distributed as a source listing only and not on magnetic media. There are several good reasons for this. First, fig-FORTH is a machine-independent system and many more users can use FORTH software if it's in this form. Second, I originally developed CODE9 for my own use on my Apple II to implement 6809 fig-FORTH for the "MILL" 6809 card for the Apple. This task is currently in progress. So you can see that I could not easily send in a FLEX disk! Third, those interested in purchasing only an assembler would be "roll your own" types who have purchased the 6809 source listing for FORTH from the FORTH Interest Group and wish to upgrade to a complete FORTH language system. FIG supplies only source listings and documentation for fig-FORTH and does not market assemblers. As far as I know, CODE9 is the only 6809 FORTH Assembler available separately and not as part of an expensive package. This allows (a good typist!) to get a complete FORTH system for under \$50!

The documentation and source listing provided is more than sufficient for a proficient FORTH programmer to modify to his liking. Although long branch instructions were not implemented, they can easily be added by coding new words such as `LELSE`, `LEWOIF`, etc. by making simple modifications to the existing words `ELSE`, `ENDIF`, etc. I did not add these words to the original implementation of CODE9 for two reasons: FORTH code definitions should always be kept as short as possible as a matter of good FORTH style and FORTH is inherently a position-dependent language. Therefore, long relative branches are not needed in good FORTH programming and are not necessary since code is not relocatable.

Another intended user for CODE9 is the person who already has a FORTH system on a non-6809 based machine but wishes to generate 6809 code. In the normal sense, this use of CODE9 makes it a cross-assembler. In

## COMPOSITE VIDEO OUT FOR CT-82

TEACHING BASIC TO LAMAR CLASSES USING A CT-82 (or any nine inch screen) IS ROUGH ON THE STUDENT'S EYES. I ADDED A COMPOSITE VIDEO OUTPUT TO THE CT-82 AND DRIVE A TELEVISION MONITOR WITH IT. HERE IS HOW TO DO IT.

THIS MODIFICATION HAS NEVER BEEN MADE TO THE 8212 TERMINAL AND SHOULD BE THE SAME FOR THE 4229. IT IS ALMOST EFFORTLESS WITH THESE NEWER MODELS BECAUSE THE FOIL SIDE OF THE VIDEO CONTROLLER BOARD LIES UP ON TOP OF THE VIDEO BOARD.

OF COURSE, THE EXTRA MONITOR'S VIDEO BANDWIDTH MUST BE WIDE ENOUGH FOR 40 CHARACTER LINES. I HAVE USED THIS OUTPUT FOR A QUICK CHECK OF THE QUALITY OF MONITOR MONITORS.

THE FIRST STEP IN ANY CASE IS TO DETERMINE IF YOU HAVE A MOTOROLA OR A ZENITH MONITOR IN YOUR TERMINAL. THE ZENITH USES NEGATIVE GOING VERTICAL SYNC. THE MOTOROLA USES POSITIVE GOING VERTICAL SYNC. ON THE VIDEO BOARD OF THE TERMINAL, PINS 11 & 10 ARE WIRED TO INVERT THE SIGNAL FOR THE ZENITH. THOSE PINS ARE FREE WHEN THE MOTOROLA MONITOR IS USED.

PLEASE UP PLASTIC (VIA TRANSISTORS (TO-92) AND YOU MAY USE THEIR LEADS AS SUPPORTS WITH A MINIMUM OF WIRING. SHAPE PROPERLY BEFORE SOLDERING.

FIND THE VIDEO BOARD LAYOUT CHART (T-4) IN YOUR TERMINAL MANUAL. SPREAD OUT THE VIDEO CONTROLLER SCHEMATIC. DETERMINE THE PIN LAYOUT OF IC 26 (NEAR THE VIDEO CABLE CONNECTOR). PIN 1 IS TOWARD THE CENTER OF THE BOARD AND PINS 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

ON THIS STEP ONLY IF THE MONITOR IS A MOTOROLA, DISCONNECT THE PLUGS FROM THE VIDEO CONTROLLER BOARD. REMOVE THE TWO LONG SCREWS AT THE FRONT EDGE OF THE BOARD. HAVE PIN 11 PIN UP WITH THE TALL AND SHORT SPACERS. UNPLUG THE VIDEO BOARD FROM THE VIDEO BOARD. SET IT ASIDE. THE TRANSISTORS WILL BE MOUNTED ON THE COMPONENT SIDE OF THE VIDEO BOARD WITH THE CT-82. HOWEVER, YOU MUST REMOVE THE VIDEO BOARD ALSO TO CUT PINS 11 & 10. RUN A SMALL WIRE FROM IC 26, PIN 3, TO IC 19, PIN 11 (IT IS BY THE 5 VOLT REGULATOR). CUT THE FOIL BRIDGEING IC 26, PIN 4, AND RUN A WIRE FROM IT TO IC 19, PIN 10. NOW CUT THE FOIL GROUNDING IC 26, PIN 6 AND CONNECT IT TO THE JUNCTION OF R1 AND R2 (CHARACTER HORIZONTAL).

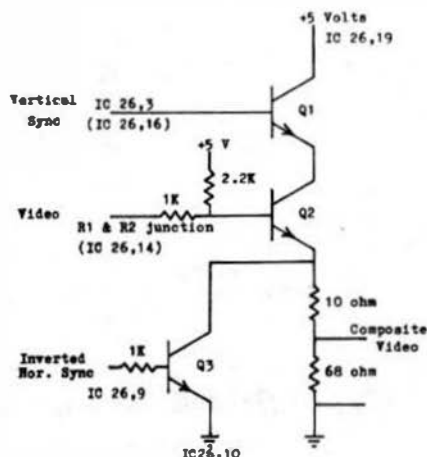
REFER TO SCHEMATIC "VIDEO OUT". THIS TOTAL POINT OUTPUT STAGE MIXES THE HORIZONTAL AND VERTICAL SYNC SIGNALS WITH THE CHARACTER AND CLIPPER OUTPUT. CREDIT FOR LAMAR'S TV TYPEWRITER COOKBOOK FIGURE 4-15A (on Page 102 of the first printing, 1-76, SNMS 21313) FOR THIS APPROACH TO THE CIRCUIT.

CAREFULLY DETERMINE WHERE THE +5 VOLT AND GROUND FOIL PATHS ARE ON THE VIDEO BOARD. TRACK FROM THE REGULATOR, IC 38. YOU SHOULD DOUBLE CHECK THAT THE SUPPLY AND GROUND CONNECTIONS YOU USE ARE IN FACT CORRECT.

NOW WIRE ACCORDING TO THE VIDEO OUT DIAGRAM FOR YOUR TYPE OF TERMINAL. I FOUND THE SUGGESTED PIN LOCATIONS VERY CONVENIENT. IF YOU HAVE SMALL DIAMETER 25 VOLT CABLE, MIN IT TO A REAR CONNECTOR. I USED AN B-18 ON THE METAL BACK OF THE TERMINAL. IF YOU DRILL IN THE METAL TO MOUNT A CONNECTOR, I SUGGEST THAT YOU REMOVE ALL EXCEPT THE MOTHERBOARD FROM THE TERMINAL CASE. IT PROBABLY NEEDS DUSTING ANYWAY.

ROBERT E. PATTERSON, SOX, AR 72051

## VIDEO OUT MODIFICATION



Q1 : (Motorola Monitor) when different from the Zenith.  
Q1,2 : Plastic case 282222

## NEW PRODUCT ANNOUNCEMENT

CODE9 is an M6809 Assembler for use with any fig-FORTH system. It features all M6809 addressing modes except long relative branch instructions and performs syntax error checking at assembly time.

Memory requirements: 4.75K bytes free RAM above FORTH.

The 14 page manual not available separately includes:

1. Examples of M6809 instructions using all addressing modes. The FORTH Assembler format and standard Motorola Assembler format are compared for each instruction.
2. A description of the different types of pseudo-high-level constructs used to assemble all relative branch instructions.
3. A detailed description of the error checking mechanism used to detect syntax errors or illegal instructions.
4. An example of a typical CODE definition using CODE9.

Bound with the manual is a 12 page commented source listing of the assembler. The documentation presumes familiarity with FORTH assemblers in general and M6809 assembly language programming.

CODE9 is distributed as a commented source listing and manual.

Product shipments to date: 3

Price:

CODE9 source listing and manual = \$20 U.S. includes tax and shipping within the continental U.S.

Vendor support is provided by phone and correspondence. Include a SASE with questions. Updates will be sent to registered owners.

Available immediately from:

my own case, I have 6502 fig-FORTH running on my Apple complete with 6502 assembler, text editor, etc. which I developed myself. I used this system to write and debug CODE9. Using a FORTH target compiler, my next step will be to cross-compile FORTH on my system. Using CODE9, this will be 6809 fig-FORTH, which I will run on the Apple using a 6809 processor card. I expect at least a 3 to 1 improvement in speed, since the 6809 is practically a FORTH Virtual Machine in Silicon. Anyone else can use CODE9 in the same manner on any system running fig-FORTH.



Anyway, I appreciate your help in reviewing CODE9 and hope you have an avid Forth programmer to send it to. I will look forward to hearing your comments.

FORTHrightly,  
Arthur M. Gorski  
Arthur M. Gorski

Dear Mr. Williams:

As sending this short source listing that is a modification to "MINIFLEX director.asm" in last month's Journal. The modifications allow the program to run on FLEX 2.0. This is not much of a program's feat; however, it may save someone a little head scratching—that is, if you think it is worth printing! Thanks as in for a fine magazine and for allowing me a chance to share some of my programs with your readers!

Looking forward to next month's issue!

Sincerely yours,

Jerry P. Starzinski  
POBx 9436  
Yakima, WA 98907

```

NPM          DIRECTOR.ASM (VER 25.1) FLEX 2.8 MODS
OPT          PAG

*****
*          VERSION 25 : MOD 1-0
*
* <><><>ONLY ROUTINES THAT WERE MODIFIED <><><><>
* <><><>ARE LISTED IN THIS SOURCE FILE  <><><><>
* <><><>SEE ORIGINAL SOURCE LISTING BELOW<><><><>
* <><><>FOR FULL PARTICULARS OF PROGRAM! <><><><>
*
*
*          MODIFIED FOR FLEX2.8 BY
*          JERR P. STARZINSKI 10 NOV 1981
*
*****

SPC
*****
* Computer:  SWTPC 6800
* Hardware:  MF-68 (Dual drive) or compatible
*           Minimum of 12K RAM
* Software:  FLEX 2.0 (<) DOS
*****

SPC
*****
* Author:    Dennis F. W. Milligan
*            1325 Whimbrook Place
*            Burnaby, B.C.
*            Canada
*            V5A 3Y6
*
* November 1981 68' Micro Journal, Vol III, Issue XI
*            Pages 25-29
*****

```

```

SPC
*****
* FLEX 2.0 EQUATES
*****
* FLEX IS A REGISTERED TRADE MARK OF TSC
*****
WRMS EQU $A0B3
GETCHR EQU $AD15
INBUFF EQU $AD18
PSTRNG EQU $AD1E
PCRLF EQU $AD24
NXTCH EQU $AD27
GETFIL EQU $AD2D
SETEXT EQU $AD33
RPTERR EQU $AD3F
FMSCLS EQU $B4B3
FMS EQU $B4B6
SPC
GET CHAR FROM KEYBOARD
INPUT TO LINE BUFFER
PRINT CR/LF AND STRING
PRINT CR/LF
GET NEXT CHAR
GET FILE SPECS
SET FILE EXTENSION
REPORT ERROR
CLOSE OPEN FILE
FMS CALL

* COPY 1) DRIVE NUMBER
* 2) FILE NAME
* 3) EXTENSION
*
* TO WRFLIB IN PREPARATION FOR
* RENAME AND '.BAK' EXCHANGE
*

```

```

STX      XTEMP1
LDX      @WRTFCB+3
STX      XTEMP2
LDA      B      @12      SET COUNT TO 12
LOOP0    LDX      XTEMP1
          LDA      B,X      GET CHAR
          INX
          STX      XTEMP1
          LDX      XTEMP2      GET WRTFCB
          STA      B,X
          INX
          STX      XTEMP2
          DEC      B
          BNE      LOOP0      UNTIL DONE
* COPY COMPLETE
  SPC
*
* RENAME OLD FILE TO .BAK
*
* START BY BUILDING THE NEW NAME IN THE
* SCRATCH BYTES OF THE FCB
*
RENAME    LDX      @RDFCB+4
          LDA      B      @11      COUNTER
ANOTHR    LDA      B,X      GET BYTE
          STA      A      49,X      MOVE TO SCRATCH AREA
          INX
          DEC      B
          BNE      ANOTHR      UNTIL TRANSFERRED
          SPC
*
*
*
* RDFCB WILL BE USED TO READ OLD MASTER '.BAK'
* 'DIRECTOR.DIR'
*
RDFCB     RMB      320
WRTFCB    RMB      320
*
* DIRFCB WILL BE USED FOR OPENING AND GETTING
* DIRECTORY ENTRIES
*
DIRFCB    RMB      320
          FCB      $80      MARK END WITH CR
*
* DISKN2    RMB      8      STORAGE FOR DISK NUMBER
POINT     RMB      2
SAUER     RMB      2
XTEMP1    RMB      2
XTEMP2    RMB      2
*
*
*
END      START0

```

## Speech Systems

38 W 256 Deerpath Road Batavia, Illinois Tel. (312)879-6880

## NEW PRODUCT ANNOUNCEMENT

**SPEECH SYSTEMS**, manufacturer of the **SPEAK 'N' SING 1** and the **SPEAK 'N' SING 2** speech synthesizers, is proud to announce the **SING 'M' STEREO** music and sound effects synthesizer. Each channel features an 8 bit D/A converter, separate tone and volume controls, a low pass audio filter, and an on board audio power amplifier that easily drives an external speaker.

Supplied software includes single and four voice music selections and all the several sound effects. Also included is music compiler that allows one to easily develop single voice music. Available separately is a four voice stereo music compiler. The SING 'N' STEREO sound effects and music synthesizer is priced at \$69.95 and the ME-1 four voice stereo music compiler is available for \$39.95. All software is available in PLEX 2.0 or 9.0 formats and comes on 5" or 8" disks.

Interested parties are welcome to write or call for further information.

Dear Sirs:

I have read the last three issues of your magazine and find it very good. It is the only 68xx magazine which features assembly language programming regularly.

I have a problem which perhaps your staff or your readers can help me with. Our Solar Computer club needs an assembly language program which will allow I/O to the modem in the following manner 1. It must not interfere with any basic function but act as an

extension of basic.

2. It should accept data from the screen and treat it exactly the same as it would input from the keyboard.  
3. It must output to the screen anything which is displayed on the screen. Including keystrokes input from the keyboard.  
What we want is to be able to connect two or more color monitors together over the same lines and have either one respond to commands entered from either computer.  
Anyone who can help us please write to Ron Garrett 2181 East Main St. Henderson Tx. 75632

Your last issue has an article on the Exatrim Expansion Interface I have had one for awhile now and find all it is, is a high priced disc controller. If you already have 32K (and who doesn't?) the extra money is useless as it cannot be accessed from basic. If however they come out with a DOS which will operate 80 track 5250 Disk then it will be worthwhile at the present I think Radio Shack has a better disk system and at lower cost.

Now about something on the very fine products out for the CC by Spectral Associates. I have their Space Trilogy and a 32K expansion interface (soon will have 64K expansion interface) The Meteoroids program and Space Invaders is the best I've seen anywhere on any machine. It even beats Radio Shack's Ron Packs.

The program I am using to write this letter is a one liner and effectively turns the Color Computer into an electronic typewriter and allows you to edit text before printing. Here is the simple program. 10 LINE INPUT AS:PRINT#2,AS:GOTO 10  
Feel free to print it.

Keep up the good work!

Yours truly,

*Ron Garrett*  
Ron Garrett

P.S. Anyone out there got any good chess programs for the C.C.? \*

DANIEL J. HOROWITZ

8908 PRATT STREET  
ALEXANDRIA, VIRGINIA 22304

August 25, 1981

68 Microjournal  
3018 Hamill Road  
PO Box 849  
Rizeon, TN 37343

To the Editor:

I am writing to report that the Thomas Instrumentation 48k static memory board works as advertised. I ordered it partly because of the low price, fully expecting that it might take some time to get it because it is a new product. However it arrived in less than a month and worked as soon as it was plugged in. I now have all the memory of my SWTP computer on one board.

Apparently the availability of 16k static memory chips from Japan had greatly decreased the cost of static memory. The new chips also take very little power. They don't get hot at all, whereas my old 16k memory boards with 4044's really put out the BTU's.

Yours truly,

Daniel J. Horowitz

*Daniel J. Horowitz*



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Flex Version	\$899.00 list (available now)
Uniflex Version	399.00 list (available September 1981)

## HELP

Need control codes and sequences for all CT-82 functions (writing an emulator). Also need the source for a 6800 Basic that will handle floating point, and a 6809 FLEX chess program.  
Eric Pierce

933 Queen Street, Cornwall Ontario, Canada K6J 1P3

## CLASSIFIED ADS

SWTPC, 20K, MPC, MPL, Joystick, Gr6144, SWTBUG, AC30, Software, \$500. Microcroma, 6K display mem. \$225. SCMP w/kbd \$85.

Bert Quinn

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1(609) 896-0347

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\*\*\*

SWTPC MP-8M socketed 8K static memory board \$85, SWTPC DC-3 disk controller \$100 or best offer.

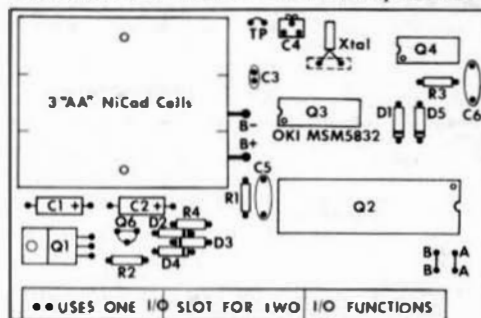
Tom Harmon

15418 Diana Lane, Houston, Tx 77062

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\*\*\*

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\* FULLY DOCUMENTED: instructions; diagrams; theory; more than 20 pages of sample software (automatically puts date in Flex2<sup>®</sup> date buffer, adds time-of-day to assembly listings, maintains calendar, current time/date display on top line of CRT). Batteries not included. All IC's socketed.

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This program takes files of variables, such as names and addresses, and inserts them into a Stylograph text file for automated mail list generation. It will also allow a number of Stylograph text files to be appended at printout time so that page numbers and headings will be continuous in the printout.

\$125, manual \$10.

## STYLOGRAPH SPELLING CHECKER

This is a valuable addition to any word processing application. It checks all words in a manuscript against an internal dictionary. The dictionary included has a vocabulary of over 20,000 words and is fully expandable. New words encountered in the text may be added to the dictionary making the creation of custom tailored and foreign language dictionaries a snap.

\$145, manual \$10.

When ordering specify operating system (FLEX™, Unixflex™) and disk size. VISA & MC accepted.

20% discount on 3 program order.



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DISASSEMBLER for 6800/1/9

-analyze (6800/1/5/9&6502) or (Z-60.6080/5)

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-includes xref and name-changer

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INTEXT, DISK-EXP, \*DISKSAVE.

Disk-4: MAILING PROGRAM, \*FINDDAT, \*CHANGE,  
\*TESTDISK.

Disk-5: \*DISKFIX 1, \*DISKFIX 2, \*\*LETTER,  
\*\*LOVESIGN, \*\*BLACKJAK, \*\*BOWLING.

NOTE: All are as published or received by 68  
Micro Journal, some have fixes and patches.

This is a reader service only! No Warranty is  
offered or implied, they are as received and are  
for reader convenience ONLY. Also 6800 and 6809  
programs are mixed, as each is fairly simple  
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68 MICRO JOURNAL  
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Hixson, TN 37343  
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\* Indicates 6800, \*\* Indicates BASIC SWTPC or  
TSC - 6809 no indicator.

MASTER CARD - VISA accepted - Foreign add  
sufficient postage surface or air!!



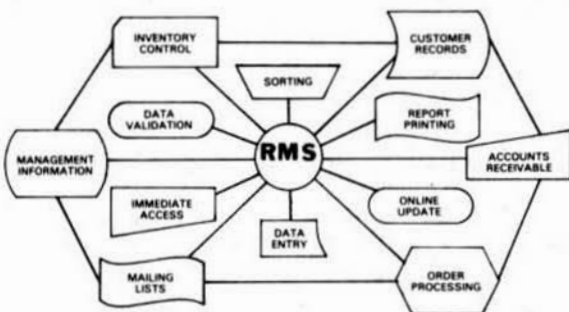
# 6809

## RECORD MANAGEMENT SYSTEM

# RMS

# DATABASE MANAGEMENT

- USER DEFINED RECORD FORMAT VIA DATA DICTIONARY
- SCREEN ORIENTED, FORM FILL OUT TYPE OF ACCESS
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- BUILT-IN SORT/MERGE
- EASY TO USE



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RMS is a complete DATABASE MANAGEMENT package for the 6809 computer. It is made up of five machine language programs that make up the most powerful business programming tool available for the 6809. It can be used by the relative novice, to implement an incredible variety of information storage and retrieval applications, without any programming. However, the programmer can use RMS as part of the solution to a larger problem, saving many hours of unnecessary program development time. RMS can be used to handle data input, editing, validation, on-line retrieval, sorting and printed reports. Custom data manipulation can be filled in by the user's BASIC programs.

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TERMS: VISA / MC / PREPAID

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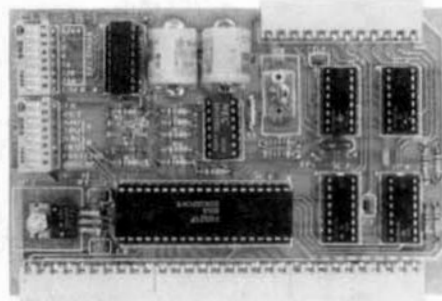


## MARK DATA PRODUCTS

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### CALENDAR-CLOCK / TIMER / PARALLEL PORT



#### Calendar - Clock

CLK68-1

- Keeps date and time without need for batteries
- All clock functions software controlled
- On card battery (included) and charging circuitry make the clock
- Day of week, month/year, hour:minute (12/24 hr)

#### Interval Timer

- For color spelled, multi-timing, etc.
- Compatible with 6800 and 6809
- OS-9 runs faster with CLK68-1 than with timers such as 6809
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#### Parallel I/O Port -- Fully buffered 8 bit parallel port

- DIP switches select level or output voltage (as shown on the board)
- Compatible with Parallel Printer drivers in most versions of BASIC

#### Construction -- Fully mounted, unless noted, a nice screened

#### Manual -- Well documented - 36 pages

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Assembled and tested	\$119.95	Kit	\$89.95
Goldplated bus conn	7.50	2 MHz option	2.50
Disk 5 or 8 in. SSB or Flex* OS-9 Available NOW			14.95

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# COLOR COMPUTER SYSTEMS SOFTWARE

## MODEM COMMUNICATIONS

Make your Color Computer an intelligent printing terminal with off-line storage! The Microtext module is just what you'll need for:

- Talking to a timeshare system or information service
- Printing out what is received as it is received
- Saving received text to cassette tape
- Re-displaying the received text even while on-line
- Communications with other computers
- Using your computer as a general-purpose 300-baud terminal
- Downloading programs from other computers

The Microtext module is a program pack containing not only firmware but a second serial port so that both your printer and modem can be connected at the same time. Microtext can be configured for any serial printer that will work with the Color Computer, even if it requires line feeds! But even if you don't have a printer, you can keep a permanent copy of your data by storing to cassette tape. Also, any Radio Shack/Centronics-compatible parallel printer may be used by adding the Micro Works' P180C parallel interface.

For those of you with special terminal applications, Microtext has selectable parity: it sends odd, even, mark or space. With mark parity (which is default) you can send to computers requiring either seven or eight bits. All 128 ASCII codes can be sent. Exchange programs with other Color Computer users! Basic programs may be downloaded from other computers or timesharing systems.

You'll find many uses for this versatile module! Available in ROMPACK, ready-to-use, for \$59.95.

## EDITOR/ASSEMBLER

The Micro Works Software Development System (SDS80C) is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack! Vastly superior to RAM-based assemblers/editors, the SDS80C is non-volatile, meaning that if your application program bombs, it can't destroy your editor/assembler. Plus it leaves almost all of 16K or 32K RAM free for your program. Since all three programs, editor, assembler and monitor are co-resident, we eliminate tedious program loading when going back and forth from editing to assembly and debugging!

The powerful screen-oriented Editor features finds, changes, moves, copies and much more. All keys have convenient auto repeat (typematic), and since no line numbers are required, the full width of the screen may be used to generate well commented code.

The Assembler features all of the following: complete 6809 instruction set; complete 6800 set supported for cross-assembly; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; and mnemonic error codes instead of numbers.

The versatile ABUG monitor is a compact version of CBUG, tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, breakpoints and more. SDS80C Price: \$89.95

## MACHINE LANGUAGE

**MONITOR TAPE:** A cassette tape which allows you to directly access memory, I/O and registers with a formatted hex display. Great for machine language programming, debugging and learning. It can also send/receive RS232 at up to 9600 baud, including host system download/upload. 19 commands in all. Relocatable and reentrant. CBUG Tape Price: \$29.95

**MONITOR ROM:** The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The EPROM plugs into the Extended Basic ROM Socket or the Romless Pak I. CBUG ROM Price: \$39.95

**SOURCE GENERATOR:** This package is a disassembler which runs on the color computer and generates your own source listing of the BASIC Interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. 80C Disassembler Price: \$49.95

## LEARN 6809!

**6809 ASSEMBLY LANGUAGE PROGRAMMING**, by Lance Leventhal, contains the most comprehensive reference material available for programming your Color Computer. Price: \$16.95

# HARDWARE

## PARALLEL I/O

**USE A PARALLEL PRINTER** with your Color Computer! Adaptor box plugs into the serial port and allows use of Centronics/Radio Shack-compatible printers with parallel interface. Assembled and tested. P180C Price: \$69.95

**ROMLESS PAK I** — is an empty program pack capable of holding two 2716 or 2732 EPROMs, allowing you up to 8K of program! The PC board inside comes with sockets installed, ready to go with the addition of your custom EPROMs. Price: \$24.95

**SPARE PARTS** — SAMs, 6809Es, RAMs, PIAs. Call for prices.

## 32K RAM!

**MEMORY UPGRADE KITS:** Consisting of 4116 200ns. integrated circuits, with instructions for installation. 4K-16K Kit Price: \$39.95. 16K-32K Kit (requires soldering experience) Price: \$39.95

# GAMES

**Pak Attack** — Try your hand at this challenging game by Computerware, with fantastic graphics, sound and action! Cassette requires 16K. Price: \$24.95

**Berserk** — Have fun zapping robots with this Hi-Res game by Mark Data Products. Cassette requires 16K. Price: \$24.95

**Adventure** — Black Sanctum and Calico Island by Mark Data Products. Each cassette requires 16K. Price: \$19.95 each.

**Star Blaster** — Blast your way through an asteroid field in this action-packed Hi-Res graphics game! Available in ROMPACK, requires 16K. Price: \$39.95

THE MICRO  
WORKS



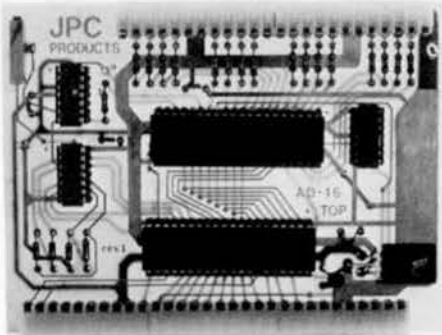
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Also Available Accountants Write-Up System. Written under Flex™. Includes General Ledger, Financial Statements, Payroll. Source Code Available under License Agreement.

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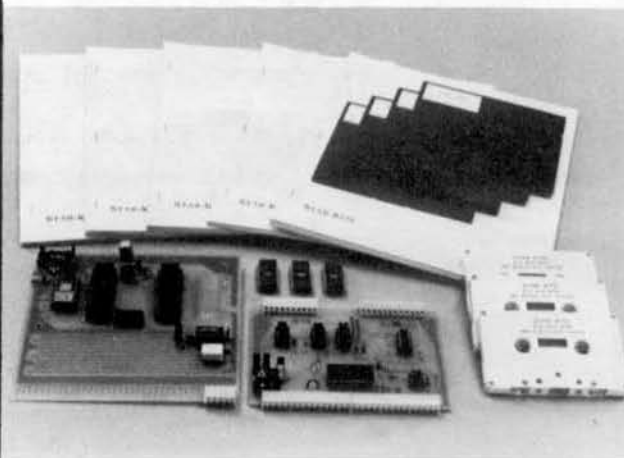
Unixlex and Flex are Trademarks of Technical Systems Consultants, Inc.

# dp systems

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'68' Micro Journal

# STAR-KITS



## 6800 HARDWARE

**SBC-02** single board computer uses 6802 with RAM, ROM, I/O. Ideal controller, intelligent interface, and more. Printed circuit board is \$25. complete controller kit \$75. wired and tested \$150. Also available: HUMB-BUG (see below), Basic in ROM, etc.

**CT-PS** serial/parallel interface card. ACIA-type interface for RS-232C terminal and/or a parallel keyboard. Makes keyboard look like a terminal with absolutely no program patching. Ideal for video board based systems. Bare board \$20. complete kit \$55. wired \$100.

## 6800 AND 6809 FIRMWARE

**6800 HUMB-BUG** monitor. Totally MIKBUG compatible, plus single-stepping, multiple breakpoints, formatted memory dumps, multiple port control and more. "Fantastic!" say our customers. 2K version \$40 on 2708 or 2716 EPROM with source listing. Alternate versions, including video board versions available.

**6809 HUMB-BUG-09** has all the features of 6800 HUMB-BUG and more. Not just a compatible monitor, but a debugging package and system I/O manager as well. Two ROMs, manual and full program listing for \$75. Also available in video board versions.

## 6800 AND 6809 SOFTWARE

**BASIC UTILITY PACKAGE** rennumbers, pretty-prints, prints variable and transfer indexes, compares, shortens Basic programs. On Percom or miniFlex\* disk for \$30.

**CHECK 'N TAX** balances your checkbook, finds errors, prepares income tax data. On Percom, miniFlex\*, Flex 2.0\* or Flex 9\* disk for \$40.

**SORT-MERGE**—the only one for Percom disk systems, sorts even full-disk files. \$35.

**NEWTALK** for your 6800 or 6809 system makes it talk to you. This memory dump utility outputs through a music board or any PIA port. \$30 on Percom or Flex 2/9 disk, or cassette.

**6800 CROSS-ASSEMBLER** written in Basic. Assemble 6800/6802 programs on your new 6809 (or your 370 at work!). Available on 5" disk, KC cassette, or TRS-80 Level II cassette for \$9.95.

**GAME PACK** with Eliza and 3-D Tic-Tac-Toe. 5" disk or KC cassette \$15.

Send s.a.s.e. for catalog. For detailed information, buy any manual for \$5 and get \$6 credit toward purchase. (\*) is a trademark of Technical Systems Consultants.)

**STAR-KITS, P.O. Box 209, Mt. Kisco NY 10549**

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Flex version for 6800 or 6809 with 8" disk

UniFLEX version allows multiple users on one data base

Written in TSC XBASIC

Uses Standard Record IO & Virtual Array Files

Great Plains Computer Company, Inc.

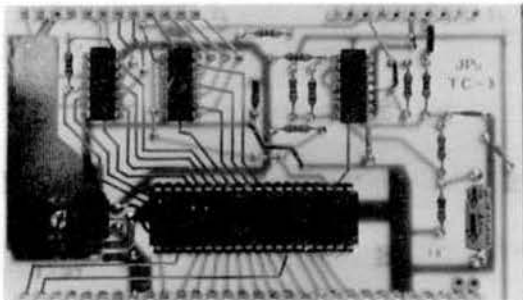
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JPC PRODUCTS FOR

## 6800 COMPUTERS



### High Performance Cassette Interface

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- **OPTIONAL** - CFM/3 File Manager.  
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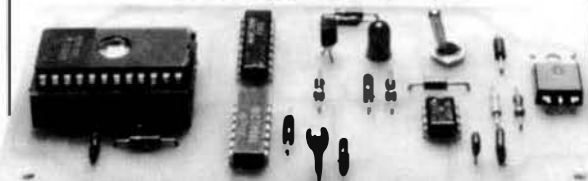
TERMS CASH, MC or VISA. Shipping & Handling \$3.00



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## EPROM PROGRAMMER KITS

Shown assembled. EPROM not included.



For single supply 2516, 2716 & 275 EPROMS. Verify erased. Program - entire or partial. Auto verify after programming. Transfer contents to RAM for modifying or duplicating.

Select Documentation for:

6502

6800

6809

8080/8085/Z80

Use with:

6 20 PIA or 6522 VIA

6820 PIA

6820 PIA

8255 PPI

Documentation includes schematic, instructions for construction, check-out and use, and software listing for specified MPU.

Complete kit of parts (includes

Welcon 24 pin ZIF socket) ..... \$ 39.95

Bare PC board and Documentation ..... \$ 15.00

Software listings for additional MPUs

(with purchase of Kit or PC board) ..... \$ 5.00

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# ALFORD AND ASSOCIATES - GOOD NEWS!

PAGE ONE

ANNO DOMINI NINETEEN HUNDRED EIGHTY ONE

TUESDAY, DECEMBER 1st.

## COLOR COMPUTER TALKS!

Alford & Associates is now shipping the SP-1 "SPEAKER PACK" for the Radio Shack Color Computer. The SP-1 plugs directly into the ROM-Pack slot, and its use requires no wiring, computer modification or electronics knowledge!

The software provided gives four computer the power or speech using nothing more than basic Peek and Poke statements. The SP-1 can add a new dimension to your games, business programs or CAD drills. Just about any application can benefit from the SP-1!

The SP-1 allows unlimited speech. Also, the SP-1 requires less memory overhead for speech than any other type of unlimited voice synthesizer on the market today. Typically, fewer bytes of storage are needed than the equivalent number of letters in English Text! Basic data statements suffice to store most any text you want! Also, no machine language routines are needed to drive it!

The SP-1 comes with sample software in Basic to demonstrate the power of this fantastic device. Alford's even supplies a version of their VOX-EDITOR to allow users who have I&K or memory to edit speech files quickly and easily (Extended Basic is NOT required)!

The SP-1 includes a comprehensive manual which provides speech theory, use of the included software, phoneme code charts, sample programs and much more!

## COMPUTERS SPEAK TEXT!

Alford's has been on the lookout for a good speech converter program for use with their SP-1 and V3-1 speech synthesizers, and report having finally found it! The program takes English text in ASCII form, converts it, and then directly drives the synthesizer! By sending the appropriate control codes, you can even switch between text conversion or speaking letters or speaking straight phoneme information!

The standard version is designed to work just like OUTPC or OUTTE. In all modes, you tell the converter with characters in the A-Z/0-9/SPACE, in conversion mode, characters are accumulated until a word is complete, then it is converted and spoken. In letter mode each character is treated as an ASCII character and pronounced. In phoneme mode, each character is treated as a single inflected phoneme code.

The Color Computer version is even easier to use. Once loaded, Basic has a new verb -- SAY. To use the converter, you simply use the command to make the computer talk: i.e., SAY "THIS IS A COMPUTER SPEECH TEST", and the Color Computer will!

## TREK-69, COLOR-TREK

Ever since Alford's introduced TREK-66 last year, we've been asking them to do a version for 6800 users and for the new TES-80 Color Computer. They said that they could have, but their old home-brew computer and a bright shiny store-bought one might not have been compatible. Either they take a chance, they hold off until they decided on which system they wanted to buy, sell, they finally decided, and at last, our wishes have come true!

If you have a MEMORY-MAPPED DISPLAY then TREK-69 or TREK-69 are for you. If you have a color computer with 16K memory (Extended Basic not required), then you should ask for COLOR-TREK.

They took the classic trek game and rewrote it completely in assembly code, making it run in REAL-TIME. The result is, we feel, the finest TREK game available!

Enemy destroyers chase you even as you move about the quadrant. Their multiple battle plans make them hard to evade! You dodge torpedoes and return fire. Damage is sustained and repairs occur as you play. Messages flash on and off. Again, all in REAL TIME!

Game difficulty levels run from SIMPLE (for beginners) to a level which, to our knowledge, only one person other than the author himself has succeeded in winning! This is not a simple game. The best time taken recorded for the swift SUICIDE OPTION is twenty-nine minutes. The fastest loss we have seen occurred in only eleven seconds!

Have a MEMORY-MAPPED DISPLAY? Then all we can ask is, why haven't you TREK-ed?

## SPEAKER BARE BOARDS!

Alford and Associates recently lowered the price on its V3-1 synthesizer. A company spokesman stated that the reduction was due to the great response that the S3-50 community has given the board. Now they are going one step further. You can now buy a bare board, manual, disk or synthesizer chip separately. See the price list for details.

**Alford & Assoc.**  
**P.O. Box 8743**  
**Richmond, Va.**  
**23230**  
**604-320-6722**

## NEW SCREEN EDITOR!!

Does your terminal have an addressable cursor like the Sproc 10-120? Does your terminal scroll when you do a sum line on the bottom line? Does your terminal run full-duplex? If not, then you should skip this ad. Otherwise, you may be ready for SCREDDITOR!!!

How would you like an editor that will handle a 252-column spread sheet? Or one that allows you to move margins anywhere and at any time? Or that handles true multi-column edit jobs like this: Or that formats text as you type? Or that allows you to set or clear tabs at any time, anywhere, with a single keystroke? SCREDDITOR!!!

Like to be able to derive what single-key operations you do with what single keys? Or for that matter, what command names you want to give the commands? YOU CAN WITH SCREDDITOR!!!

Wouldn't it be nice to be able to define up to twenty-six editing macros, with a macro length of up to 1000 characters? Or to be able to mix commands, operations and text, all in the same macro? Or even to display and edit the macros themselves just like text? Or save and load your macros from disk files? YOU CAN WITH SCREDDITOR!!!

How about file handling, would you like to edit unlimited-sized files? Or to be able to read selected lines out of one file into another? Or how about conditional previewing reading to let you see the lines before inserting them? Or be able to write lines out to new files? Or to specify where to start reading or writing, and how much at a time, and how many times? YOU CAN WITH SCREDDITOR!!!

Think about it. Thirty-two control-code operations. About fifty other commands, and the bonus is growing. Twelve justification commands alone! O.K. BY THE WAY THE ALL-NEW SCREDDITOR!!!

As if all of this, and much more than we have room for here, isn't enough, this new editor is available for VLEX 1.0, VLEX 2.0, FLEX-9, DOS68 and DOS69! OS-9 versions to be available soon (maybe as you read this, even!).

In talking to John Alford, proprietor of Alford and Associates, we were told that he is tired of writing editors. He indicates that he knows only two ways to stop: get out of the business or write the ultimate editor. It doesn't appear that he is going out of business soon!

If this hasn't convinced you that you should use SCREDDITOR!!!, then call or write for more details, or for the complete SCREDDITOR!!! spec sheet. Our only question is, why continue to edit, when you can SCREDDIT?

SCREDDITOR!!! is available for most serial terminals, and all memory-mapped displays. 6800 and 6809 versions are ready now!

## SSB DOS UTILITIES

As many of you know, Snake Signal Broadcasting's DOS is one of the best around. There are, however, one thing we felt to be lacking...disk games!

Alford and Associates has finally found how to do about adding a disk is a non-destructive and secure way, and started to write some utilities using the disk information record. Their XAME utility allows you to game your disks. The information record includes the disk name, serial number, creation date, last update date, a comment field, and last but not least, a disk file access code.

The access code led them to the second program, LOCK. With this program you can write, delete, and LIST LOCK your files!

With their LIST program, the list-locked files do not list unless you give the access code for the disk. In addition, you do not have to look at a pile of transient commands unless you want to, as LIST allows you to option the listing for certain files. LIST also lists you list the disk information record!

The UPDATE program lets you change the information record. They also include PUNCH to clean up disks, COMP to make pretty core images, and TITLE to print title pages on all of your listings.

The UTILITIES disk is available for DOS68, versions 4.0 and up, and for all versions of DOS69. The manual itself is a good reason for buying this package, as it has a batch of information on SSB disk structure.

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## THE LAST WORD...

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Most of all though, I would like to express my thanks to God, who is the major "Associate" in my business. At this time of year it seems especially appropriate to pause to give thanks and to remember the many miracles which He has performed for all of us. One of these, we take His grace for granted.

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I pray that in this next year, my work with Him will lead me closer to the place He wants me, and that I might come even better able to serve every one of you, my customers. I also hope that each one of you will pray for me and my family so that we might grow as He wants us to, and that we might be more worthy of your patronage.

Thank you again, in love and in prayer, from all of us, and especially from...

John L. Alford (proprietor)  
Sally Anne Alford (most everything else)  
Alford and Associates

## GENERAL INFO

All of Alford's software is available on 5- or 8-inch disk except where noted. Also, except where noted, all software is available for FLEX 1.0, FLEX 2.0, FLEX-9, DOS68 or OS69. Versions for OS-9 are coming soon. Software orders are normally shipped within three days. Hardware runs from stock to 30 days.

You should add \$5 for shipping on any order under \$100. Alford's pays shipping over \$100. Overseas orders, add \$10 for air mail delivery. Virginia residents add 4% sales tax. Any order received without shipping or tax (where applicable) will be returned unutilized. Unless you specify otherwise, shipping is by UPS to the U.S.

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Software piracy costs each of us. Most people don't realize that the reason that much of the available software costs what it does simply because the writer has to increase the price of his product to make up for the lost sales which result from people who steal. They are doing a good deed for a friend. A negative in that...

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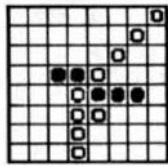
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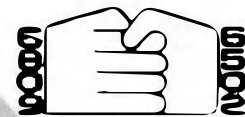


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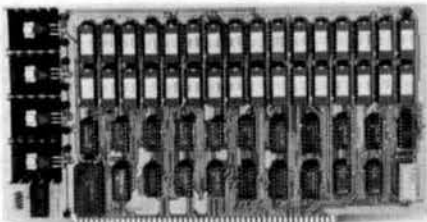
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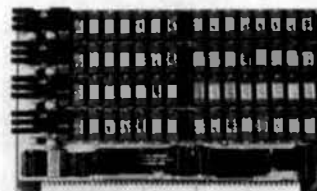
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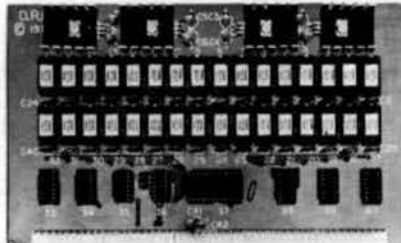
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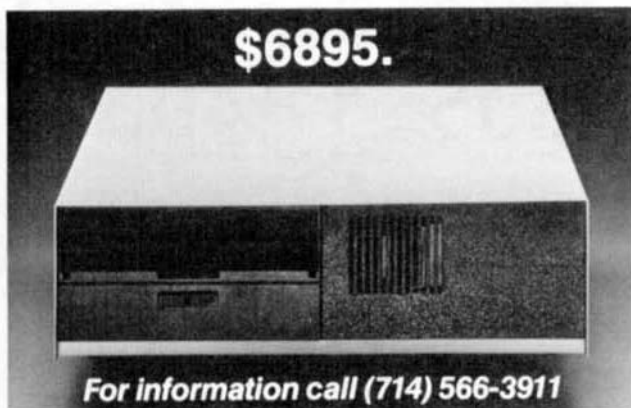
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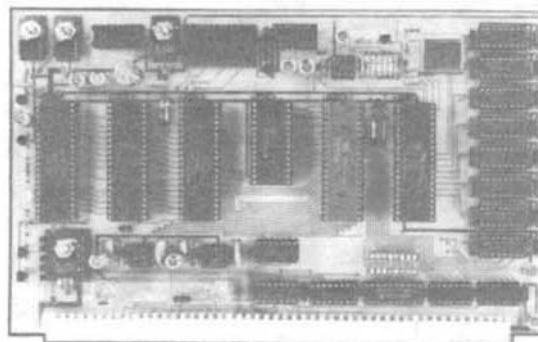
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Editor also, existing to either the monitor or DOS and then reenter (Warm Start) without destroying previously prepared text in the buffer. The Restart command erases contents in the buffer without the user having to reedit the Editor.

The Editor allows the user to toggle between full duplex (no echo) and half duplex (echo) as needed. It responds to commands in both upper and lower case and can be used to create assembler source code and Basic programs as well as text.

Specially 6800 SSB, 6800 FLEX™, 6809 FLEX™, 5" or 8" 45.00  
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**Software by Technical Systems Consultants, Inc.**

Flex™ (includes Editor and Assembler)	150.00
Uniflex™ includes one year maintenance and update)	450.00
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Assembler	50.00
6809 Cross Assembler on 6800	100.00
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6800 Flex™ Utilities	100.00
6809 Flex™ Utilities	75.00
Debug Package	75.00
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The following are available for 6800 only  
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Floating Point Package 25.00  
Scientific Functions Package 25.00

Software by Microware Systems Corp.	Y&M	SOURCE	OBJECT
OS-9™ Level One Operating System	75.00	195.00	
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SWTPC	Kit	Assembled
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DMF-2 8" DMA double density, double ended controller board	N/A	595.00
MUG-68 Multi-User Board with Multi-User Basic	N/A	100.00
68/1 Computer	295.00	N/A
4K RAM Board	30.00	40.00
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MP-8M 8K 4044 Memory board (limited quantity of kits)	160.00	275.00
532 Universal Static Memory Board	N/A	124.50
MP-09 6809 CPU board	N/A	295.00
69 Chassis, P.S., 6809 CPU, 8K, RAM, One Serial Port	N/A	799.00

**6800 CPU and Disk Controller Boards**

Due to the relative unavailability of these SWTPC items, please refer to the next column for ELEKTRA and GIMIX alternatives. Phone for SWTPC availability.

**Universal 68XX Bare Motherboard.** SS-50-58C, 4/16 addresses per port 60.00  
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Male with square cross section pins each 75  
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Microtime 6800 Calendar and Clock Board (assembled and tested) 10.00  
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(See review Feb 1980 68 Micro Journal)

Microtime II 89.95  
Data Mart 16K EPROM bareboard (2708 chips) 30.00

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DPP Dual Port Parallel Interface Board and Doc	20.00	60.00	80.00
Cable (Two required for each interface)			20.00
M8 Motherboard and documentation	N/A	N/A	N/A
C.U.-8/9 6809-6809 CPU (Run 6800 or 6809 software)	50.00	N/A	N/A

(6808 is 6800 software compatible)

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The Chieftain series includes 5¼- and 8-inch Winchesters that range from 4- to 60-megabyte capacity, and higher as technology advances. All hard disk Chieftains include 64-k memory with two serial ports and DOS89D disk operating system.

## ● LIGHTNING ACCESS TIME

Average access time for 5¼-inch Winchesters is 70-msec, comparable to far more costly hard disk systems. That means data transfer *ten-times faster* than floppy disk systems.



## ● 2-MHZ OPERATION

All Chieftains operate at 2-MHz, regardless of disk storage type or operating system used. Compare this to other hard disk systems, no matter *how* much they cost!

## ● DMA DATA TRANSFER

DMA data transfer to-and-from tape and disk is provided for optimum speed. A special design technique eliminates the necessity of halting the processor to wait for data which normally transfers at a slower speed, determined by the rotational velocity of the disk.

## ● RUNS UNDER DOS OR OS-9

No matter which Chieftain you select . . . 5¼- or 8-inch floppy, or 5¼- or 8-inch

Winchester with tape or floppy back-up . . . they *all* run under DOS or OS-9 with *no need* to modify hardware or software.

## ● UNBOUNDED FLEXIBILITY

You'll probably never use it, but any Chieftain hard disk system can drive up to 20 other Winchesters, and four tape drives, with a single DMA interface board!

## ● SMOKE SIGNAL'S HERITAGE OF EXCELLENCE

This new-generation computer is accompanied by the same *Endurance-Certified* quality Dealers and end-users all over the world have come to expect from Smoke Signal. And support, software selection and extremely competitive pricing are very much a part of that enviable reputation.

## 20-Megabyte Tape Streamer Back-Up Option

Available with all Chieftain hard disk configurations. This cartridge tape capability provides full 20-megabyte disk back-up in less than five minutes with just one command, or copy command for individual file transfers. Transfers data tape-to-disk or disk-to-tape. Floppy back-up is also available in a variety of configurations.

## The Chieftain Computer Systems:

Here are the Chieftain 6809-based hard disk computers that are destined to change the data processing industry . . .

### ☐ CHIEFTAIN 95W4

4-megabyte, 5¼-inch Winchester with a 360-k floppy disk drive (pictured).

### ☐ CHIEFTAIN 95XW4

4-megabyte, 5¼-inch Winchester with a 750-k octo-density floppy disk drive.

### ☐ CHIEFTAIN 98W15

15-megabyte, 5¼-inch Winchester with a 1-megabyte 8-inch floppy disk drive.

### ☐ CHIEFTAIN 9W15T20

15-megabyte, 5¼-inch Winchester with a 20-megabyte tape streamer.



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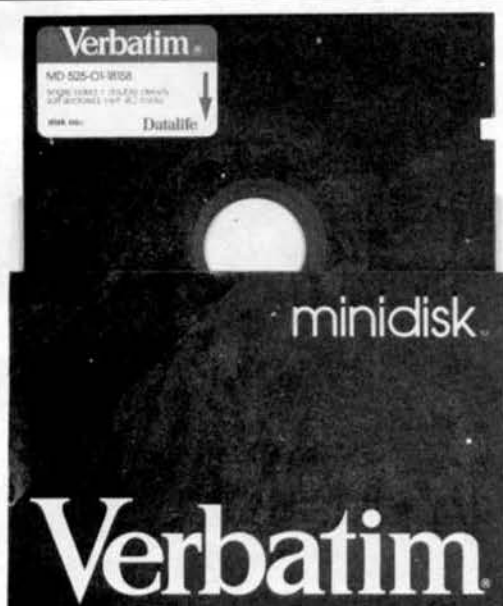
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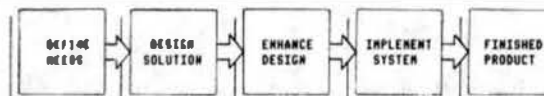


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#### BASIC ACCOUNTING SYSTEM \$350.00

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A FLEX compatible Multiple Fixed Task operating system. Allows user definition of region size for up to eight terminals/tasks and simultaneous execution of commands from all terminals.

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## Model EP-2A-79 EPROM Programmer

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EP-2A-79 115V 50/60 HZ .....\$169.00

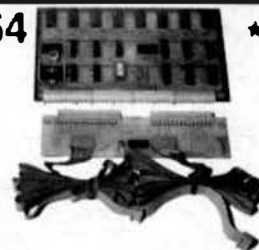
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#### 48K 2MHz STATIC RAM/ROM CARD

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- \*uses low power 2016P-2 (2128) RAM and/or 2716 ROM
- \*mix 4K blocks of RAM and ROM
- \*6800 and 6809 compatible
- \*use on SS-50 and SS-50C buss
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\*Both cards assembled with a built in logic aid & gold edge connectors

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\*Pad spacing permits most standard sockets from 8 to 64 pins

\*Provision has been made for voltage regulators

### FEATURED PRODUCT: SP-1 Bare card \$49.00 Asm. + tested \$195.00

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\*Card design includes

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(4) 6850 4 serial ports

(1) 6840 3 16 bit counter/timers

which are fully buffered and decoded

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A/T without extra features

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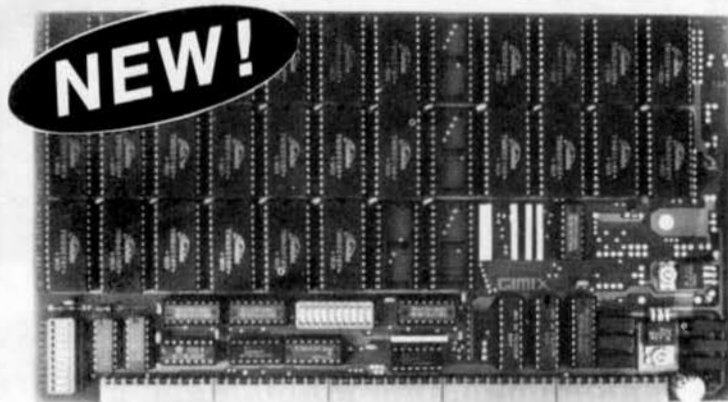
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All versions have gold bus connectors and are fully socketed, assembled, burned in, and tested. Versions with less than 64K can be expanded at any time by adding additional RAM chips.

## FEATURES:

- ★ ADDRESSABLE in two 32K sections with separate regular and extended address decoding for each section. Each section can be addressed to any 32K boundary in the address range (1M Byte with extended addressing). Each 32K section is divided into four 8K blocks that can be individually enabled or disabled. Disabled sections do not occupy address space.
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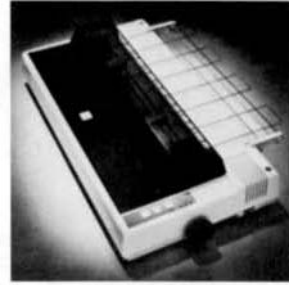
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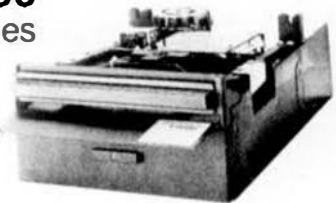
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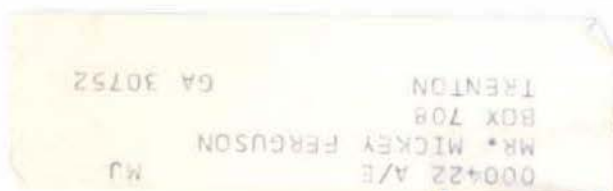
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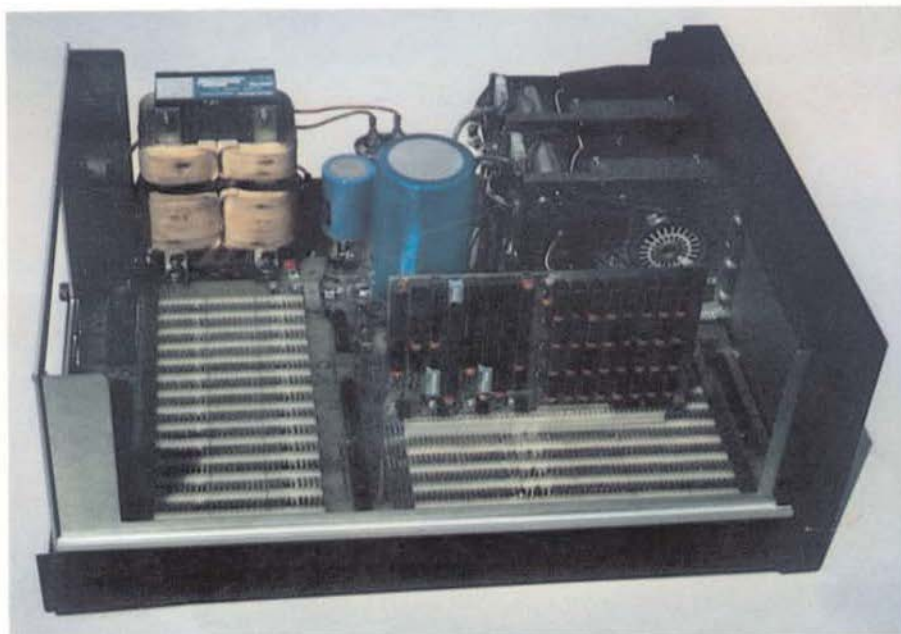
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